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SOME MARINE ASELLOTE ISOPODS FROM NORTHERN CALIFORNIA, WITH DESCRIPTIONS OF NINE NEW SPECIES

By Robert J. Menzies

In this report certain of the species of the isopod families Munnidae and Janiridae from northern California are described. The recorded species were all collected from the intertidal zones, with the exception of *Ianiropsis magnocula*, which was taken from about 30 fathoms off the California coast. Hitherto only the genus *Ianiropsis*, represented by two (really one) species, had been known from the California coast.

In order to eliminate repetition, those characteristics mentioned in the family diagnoses are not mentioned in the generic diagnoses; furthermore, characteristics enumerated in the generic diagnoses apply to the specific diagnoses and descriptions as well.

In all instances, the width of specimens is taken at the widest part of the second peraeonal somite; the length is measured on the midline from the rostrum to the tip of the telson.

Dr. Fenner A. Chace, Jr., curator of the division of marine invertebrates, United States National Museum; Dr. Melville Hatch, Zoology Department, University of Washington; and Dr. Frank A. Pitelka, Zoology Department, University of California, have all assisted through the loan of certain specimens utilized in this report. Dr. Chace and Dr. Hatch kindly lent some type specimens, which proved very helpful in clearing up the confused concept concerning *Ianiropsis kincaidi kincaidi*. Most Monterey County specimens were lent by Dr. Pitelka. They form part of a fine collection

of isopods, made by John Davis, which was deposited in the University of California collections and subsequently lent me for study. To these gentlemen I extend my sincere thanks for their kind assistance.

Family MUNNIDAE

(Cf. Nierstrasz and Schuurmans Stekhoven, Jr., 1930, p. X, e 108)

Genus MUNNA Kroyer, 1839

Munna Krøyer, Naturh. Tidsskr., vol. 2, p. 612, 1839. (Genotype, *Munna boeckii* Krøyer, 1839.)

Generic diagnosis.—In general the generic diagnosis is modified after G. O. Sars (1897–99, p. 106). Body subpyriform, with dorsal surface somewhat vaulted; last three peraeonal somites small, with lateral parts directed somewhat posteriorly. Cephalon usually broad. Pleotelson consisting of two somites: A narrow, short, anterior somite and a pyriform last somite. Eyes distinct (G. O. Sars, 1897–99) or lacking (H. J. Hansen, 1916, p. 34). First antenna with a 3-jointed peduncle and a flagellum composed of only a few joints. Second antenna with a 6-jointed peduncle and a multiarticulate flagellum. Mandible with a well-developed molar process, palp 3-jointed. Maxilliped with a 5-jointed palp. Gnathopods of adult male subchelate, often enlarged and swollen. Remaining peraeopods ambulatory, not subchelate, increasing in length, with carpal and propodal joints much elongated and bordered with spinelike 2-pointed setae; dactylar joint small, biunguiculate. Uropods with one (?) or two branches.

Remarks.—Even today this genus remains inadequately understood and contains a vast number of species. The genotype, *Munna boeckii*, is still imperfectly known, especially in respect to the minute structure of the mouth parts, uropods, and pleopods. For that reason the diagnosis here given is very liberal, and I believe that once the genotype is better known it will be possible to divide the genus into at least two, and perhaps more, very distinct genera. It has been possible to detect on the species that I have examined a minute but clearly discernible dorsal (outer) uropodal branch, which usually has but a single seta at its apex, and which generally is concealed partly or totally by the edge of the pleotelson. This is a rather significant observation, in that the genus *Munna* has long been considered different from the other genera belonging to the family Munnidae in lacking biramous uropoda, e. g., "uropoda very small, simple" (G. O. Sars, 1897–99, p. 106); "uropoda small, simple" (Richardson, 1905, p. 480); "mit kurzen eingliedrigen uropoden" (Vanhöffen, 1914, p. 561); "uropoden einästig" Nierstrasz and Schuurmans Stekhoven, Jr. (1930, p. X, e 108); "uropoder enkla" (Hult, 1937, p. 9); et cetera.[1] It is believed

[1] After the preparation of this paper, Dr. Raymond Amar (1948) discovered an additional uropodal branch in *Munna petiti* Amar.

that the omission of reference to this minute dorsal uropodal branch has been due to its being overlooked by the several researchers who have worked on the genus, and that it will in all probability be found on the other species belonging to the genus. Of course this makes the differentiation of *Munna* from related genera a more difficult task, but at the same time it indicates closer affinities.

In three of the examined species a small but distinct squama was detected on the third joint of the peduncle of the second antenna. In a fourth species, *M. ubiquita*, there was only a slight indication of such a scale, in the form of a large seta. Reference to this observation, like that concerning the dorsal uropodal branch, appears to be lacking in the published description of species of *Munna* to which I have had access, and this character appears to have been overlooked. The squama also indicates a closer affinity between *Munna* and its related genera.

As mentioned, it is possible to divide *Munna* species into several groups, some of which may become recognized genera when *M. boeckii* is better known. The following attempt at a division of the genus, while obviously incomplete, seems none the less worthwhile:

A. Species having a leaflike, flattened, ventral uropodal branch lacking spinelike protuberances. Each male first pleopod not expanded laterally at apex, apex pointed. Gnathopods of adult male and female specimens similar. Male third pleopod with terminal joint of exopod not equal in width to width of terminal joint of endopod. Probably includes *Munna nana* Nordenstam, *Munna acarina* Miller, *Munna petiti* Amar, and *Munna ubiquita*, new species.

B. Species having rounded (in X-section) ventral uropodal branch bearing at least one large spinelike protuberance. Each male first pleopod expanded laterally at apex. Gnathopods of adult male enlarged and swollen, unlike those of adult females and subadult males. Male third pleopod with terminal joint exceeding in width the width of terminal joint of endopod. Probably includes *Munna avatshensis* Gurjanova, *M. krøyeri* Goodsir, *M. palmata* G. O. Sars, *M. stephenseni* Gurjanova, and *M. chromatocephala*, new species.

C. Species similar to those in B, except ventral uropodal branch appears to lack any large spinelike protuberance. A distinct, dorsally visible, dentate, suburopodal shelf is present, which structure is lacking in species mentioned in B. Probably includes *Munna minuta* Hansen and *Munna halei*, new species.

D. Species lacking eyes. Minute structure of mouth parts, pleopods, and uropods not known. Equals *Coecimunna* Richardson, 1908, and includes *Munna truncata* Richardson and *M. acanthifera* Hansen.

E. Species to which such assignments are impossible at the present time, owing to their being inadequately known. Includes a vast majority of the species.

The four species herein recorded, three of which are new, represent the first intertidal records for the genus from California.

KEY TO THE CALIFORNIA SPECIES OF MUNNA

a^1. Uropods small, leaflike, lacking spinelike protuberances. Male first pleopods apically pointed ---------- M. ubiquita, new species

a^2. Uropods round in X-section. Male first pleopods with apices laterally expanded.

b^1. Uropoda at least with one large spinelike protuberance. Dentate suburopodal shelf lacking.

c^1. Lateral borders of pleotelson smooth, devoid of large 2-pointed setae. M. chromatocephala, new species

c^2. Each lateral border of pleotelson with 2 to 3 large 2-pointed setae. M. stephenseni Gurjanova

b^2. Uropods lacking large spinelike protuberances. Dentate suburopodal shelf visible in dorsal view ---------- M. halei, new species

MUNNA UBIQUITA, new species

FIGURES 46–48

Munna minuta Hansen, HATCH, 1947, p. 173, not figs. 42–44.

Holotype.—Male, length 0.8 mm., width 0.4 mm.

Allotype.—Ovigerous female, length 1.2 mm., width 0.6 mm.

Diagnosis.—Eyes on fairly long immovable stalks, preorbital lobes well developed. Pleotelson with about six serrations on each ventrolateral margin. Flagellum of first antenna composed of three joints, last joint slightly shorter than second, which is about twice length of first, terminal joint with a single sensory filament at apex. Adult male and female gnathopods similar. Male first pleopod apically pointed, not laterally expanded. Second male pleopod with apex of exopod acutely pointed. Suburopodal shelf not evident. Uropodal ventral branch thin, leaflike, lacking spines.

Character of body.—Minute, mitelike, legs spindly. Patch of black chromatophores, above uropods and on male pleopods, distinctive. Antennae and body with scattered black chromatophores.

Cephalon.—Frontal margin slightly emarginate, devoid of spinelike setae.

Peraeon.—Epimeral plates evident in dorsal view on somites 2–7.

Pleon.—Pleotelson with few setae and no 2-pointed setae.

Second antenna.—As long as body. No squama observed, although a large seta occupies the place usually occupied by squama on third peduncular article. Flagellum with about 10 separate articles, first much longer than second.

Maxilliped.—With three coupling hooks.

First maxilla.—Outer lobe with about 11 apical setae, inner lobe with 3 apical setae.

Second maxilla.—Each of the two outer lobe lappets with 4 apical setae. Inner lobe with 11 apical setae and at least 4 pectinate scales along outer surface.

Mandibles.—Left mandible incisive part with 4 teeth, lacinia with 4 teeth, setal row with 3 setae, molar process expanded at denticulate

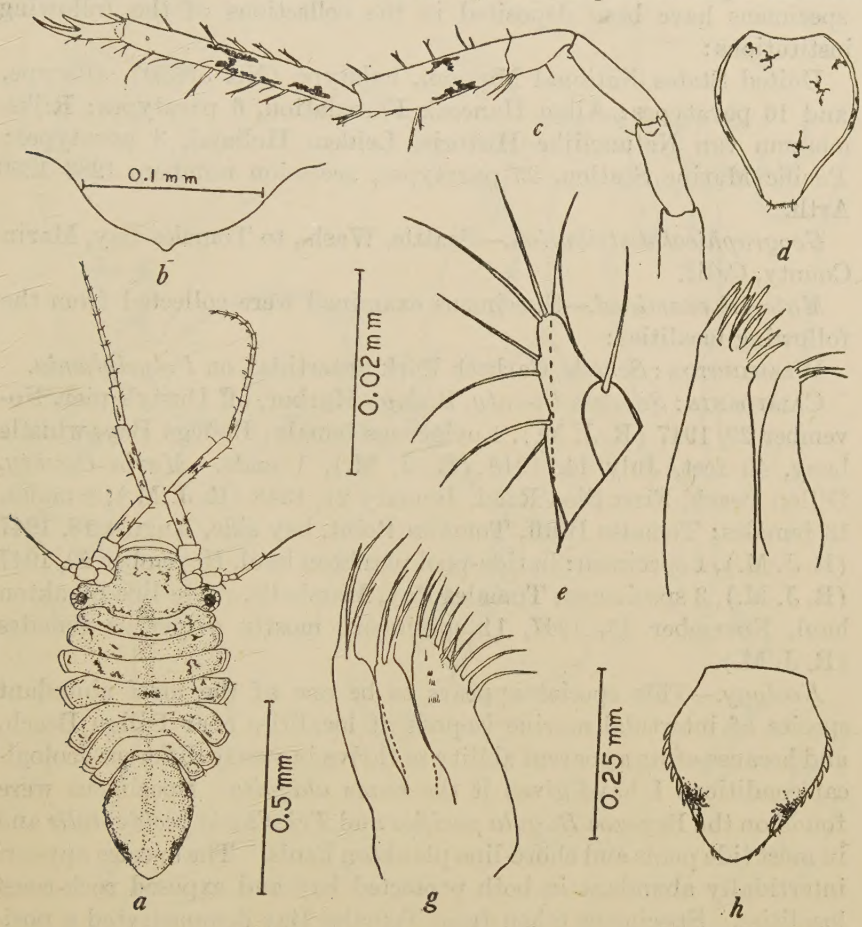

FIGURE 46.—*Munna ubiquita*, new species: *a*, Dorsal view, male paratype; *b*, apex of telson; *c*, seventh peraeopod; *d*, female operculum; *e*, uropods, left; *f*, first maxilla; *g*, second maxilla; *h*, pleotelson. (Magnification as indicated by scale: *f* and *g* same as *b*; *c* and *d* same as *h*.)

distal end. Right mandible lacking lacinia, incisor with 5 teeth, setal row with 4 setae. Terminal article of palp with two apical setae.

Gnathopod.—Carpus with three 2-pointed setae on inner distal angle, merus with a large 2-pointed seta at outer distal angle. Large black chromatophores on all articles except dactyl.

Seventh peraeopod.—Seven 2-pointed setae along inferior margin and four on superior margin of propodal joint. Other peraeopods similar in a general way to seventh.

Uropod.—Dorsal branch with a single seta, ventral branch with four setae on lateral margin and two apical setae.

Types.—Holotype, allotype, and 15 female paratypes, collected at the type locality, Marshalls, Tomales Bay, Marin County, Calif., in shoreline plankton haul, October 31, 1947, by R. J. Menzies. Type specimens have been deposited in the collections of the following institutions:

United States National Museum, holotype (No. 89520), allotype, and 16 paratypes; Allan Hancock Foundation, 6 paratypes; Rijksmuseum van Natuurlijke Historie, Leiden, Holland, 3 paratypes; Pacific Marine Station, 29 paratypes, accession numbers 1283–1290 Arth.

Geographical distribution.—Seattle, Wash., to Tomales Bay, Marin County, Calif.

Material examined.—Specimens examined were collected from the following localities:

WASHINGTON: *Seattle*, Carkeek Park, intertidal, on *Polysiphonia.*

CALIFORNIA: *Sonoma County*, Bodega Harbor, off Dusty's pier, November 29, 1947 (R. J. M.), 1 ovigerous female; Bodega Bay, whistle buoy, 40 feet, July 14, 1948 (R. J. M.), 1 male. *Marin County*, Dillon Beach, First Sled Road, January 21, 1948 (R. J. M.), 8 males, 13 females; Tomales Bluff, Tomales Point, bay side, August 18, 1947 (R. J. M.), 1 specimen; in tide-pool plankton haul, November 29, 1947 (R. J. M.), 3 specimens; Tomales Bay, Marshalls, shore-line plankton haul, November 13, 1947, 11 specimens, mostly ovigerous females (R. J. M.).

Ecology.—This species appears to be one of the most abundant species of intertidal marine isopods at localities near Dillon Beach, and because of its apparent ability to thrive in vastly different ecological conditions I have given it the name *ubiquita.* Specimens were found on the Bryozoa *Bugula pacifica* and *Tricellaria occidentalis* and in most tide pools and shore-line plankton hauls. The species appears intertidally abundant in both protected bay and exposed rock-coast localities. Specimens taken from Tomales Bay demonstrated a positive phototropism in the laboratory. Ovigerous specimens were noted during January, October, and November.

Remarks.—An examination of some paratypes of *Munna acarina* Miller (1941, pp. 311–313, fig. 2) indicates that the species is closely related to *M. ubiquita.* The specimens were kindly lent by Dr. Miller from his personal collection. *Munna nana* Nordenstam (1933, pp. 222–225, figs. 56–57) similarly appears closely related to *M. ubiquita;* however, in the paper cited Dr. Nordenstam makes no mention of the species having 2-branched uropods. In a letter recently received from Dr. Nordenstam he remarks that he has been unable to find a dorsal uropodal branch on specimens of *Munna nana. Munna ubi-*

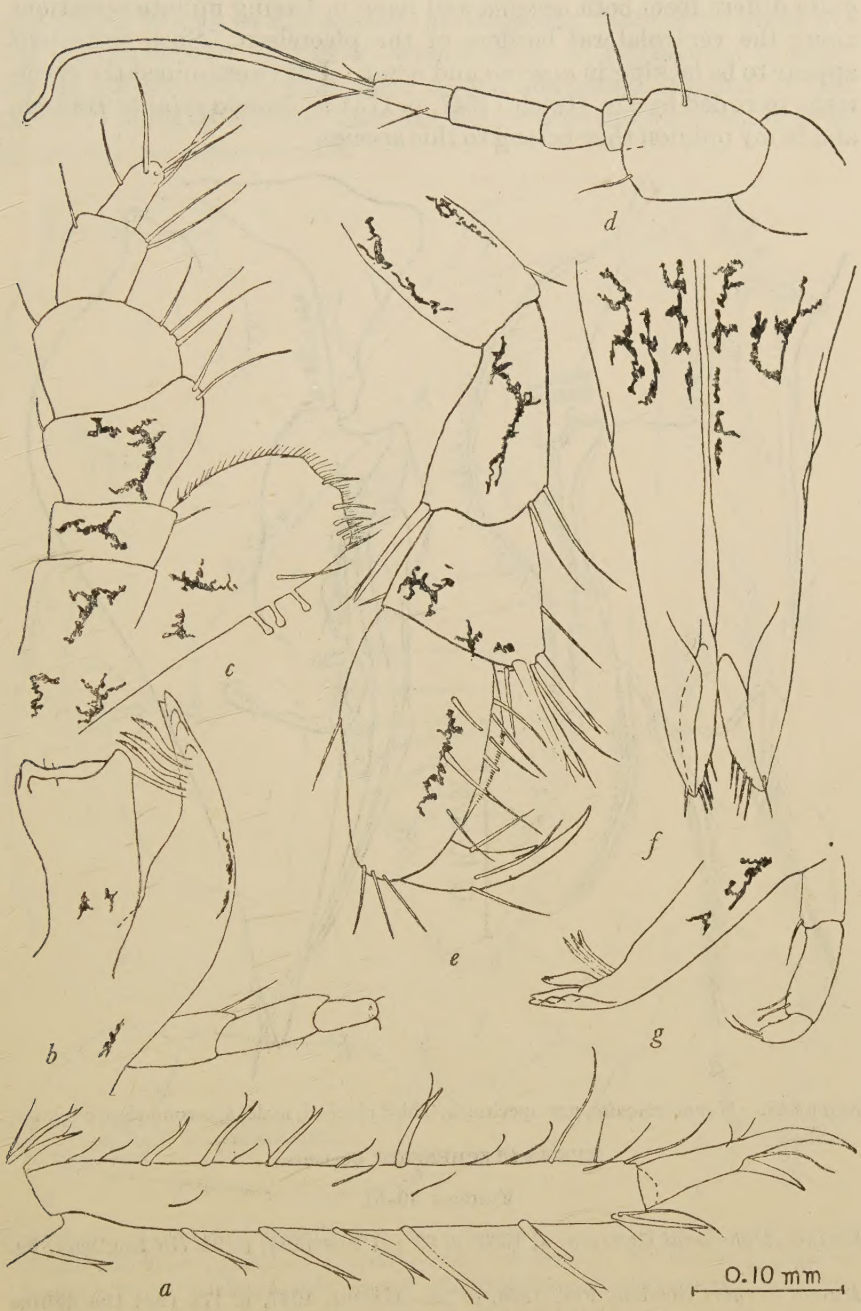

FIGURE 47.—*Munna ubiquita*, new species: *a*, Terminal articles of seventh peraeopod; *b*, right mandible, distal end; *c*, maxilliped; *d*, first antenna; *e*, gnathopod; *f*, male first pleopods; *g*, distal end of left mandible. (Magnification adjacent to *a* applies to all figures.)

quita differs from both *acarina* and *nana* in having minute serrations along the ventrolateral borders of the pleotelson. Such serrations appear to be lacking in *acarina* and *nana*. I have examined the specimens recorded by Dr. Hatch (1947, p. 173) as *Munna minuta* Hansen, and in my opinion they belong to this species.

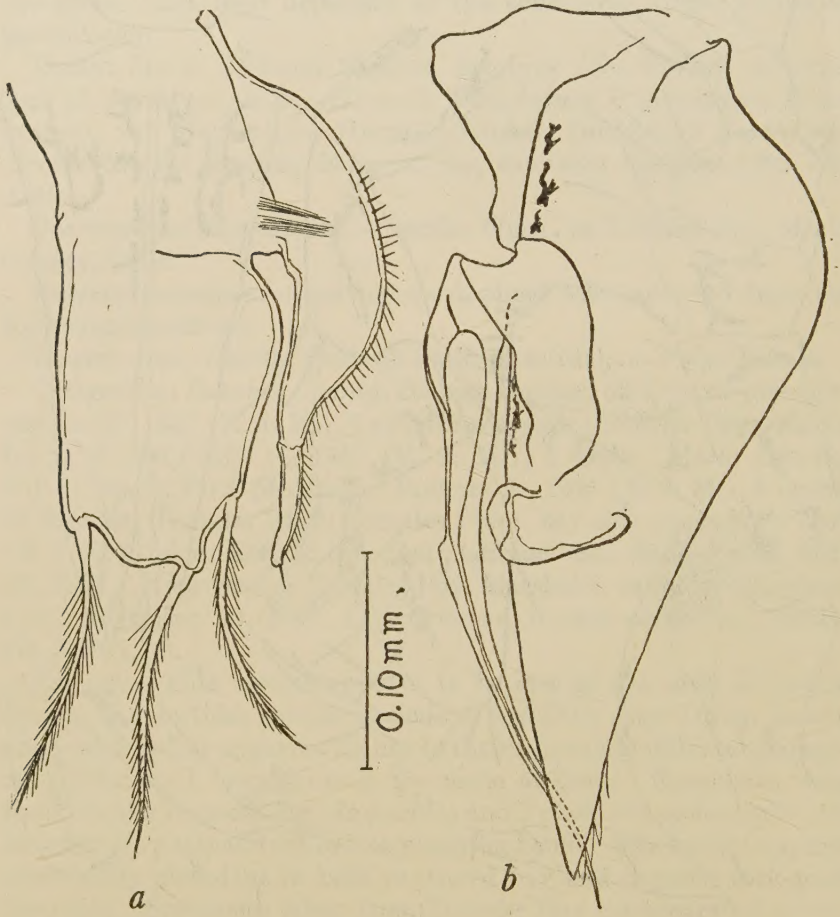

FIGURE 48.—*Munna ubiquita*, new species: *a*, Third pleopod, male; *b*, second pleopod, male.

MUNNA STEPHENSENI Gurjanova

FIGURES 49–51

Munna stephenseni GURJANOVA, 1933, p. 88 (in Russian), p. 91 (in English), fig. 15, *a–f*.

Munna krøyeri Goodsir, FEE, 1926, p. 22.—HATCH, 1947, p. 174 (not the figures given by Hatch).

The specimens taken in Marin County exhibit sufficient variation to make identification of them with Gurjanova's species seem quite reasonable. Those identified by Fee as *Munna krøyeri* Goodsir in all

probability belong to this species, although the description given by Fee applies equally well to *M. krøyeri* or to *M. stephenseni* in most details. Fee's remark that there is one abdominal segment in the species is probably incorrect, because the genus is characterized in part by having two pleon somites.

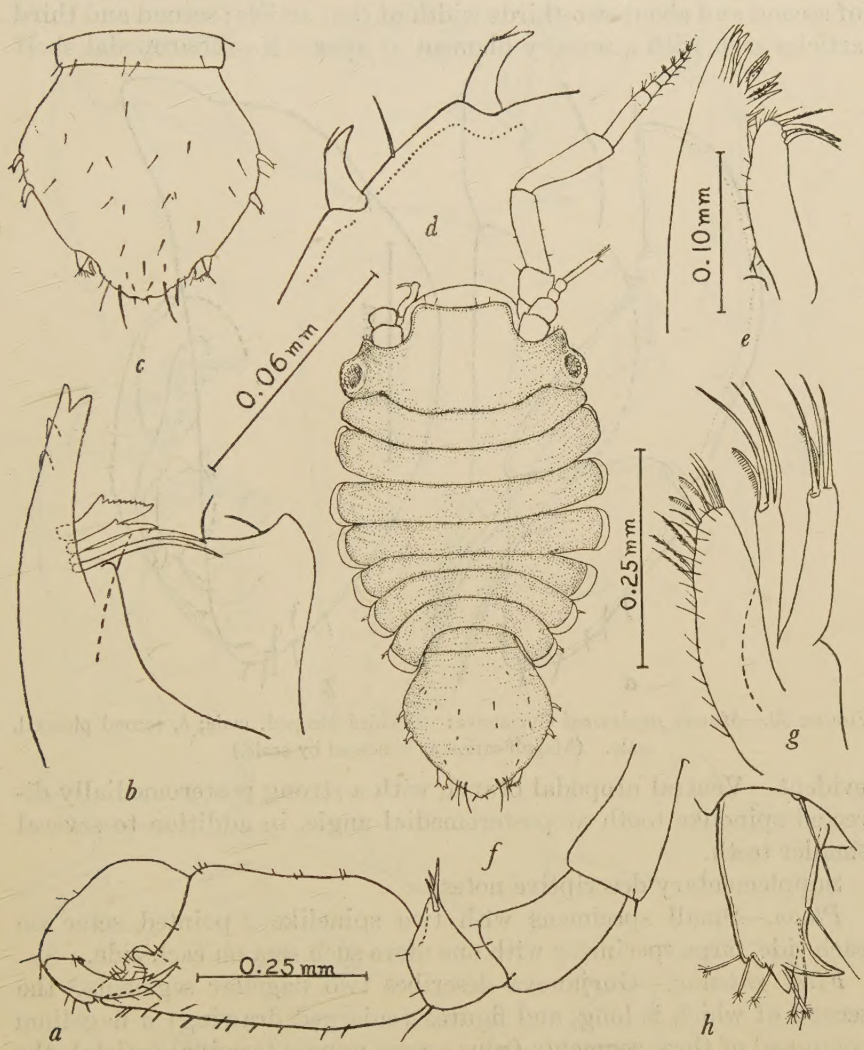

FIGURE 49.—*Munna stephenseni* Gurjanova: *a*, Gnathopod, adult male; *b*, distal portion of right mandible; *c*, pleotelson; *d*, lateral border of pleotelson; *e*, first maxilla; *f*, ovigerous female; *g*, second maxilla; *h*, right uropod. (Magnification of *c* the same as *a;* magnification of *d* and *h* the same as *b;* magnification of *g* the same as *e*.)

The following descriptive material offers a brief diagnosis of the species as well as some supplementary notes concerning structures not mentioned in the original description. The adult male gnathopod is figured for the first time.

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Diagnosis.—Eyes on short immovable stalks, preorbital lobes strong. Pleotelson with two to three large 2-pointed setae on each side anterior to uropods. Body covered with setae, which are especially evident at posterior border of pleotelson. Flagellum of first antenna in adult composed of three articles, last article about one-eighth length of second and about two-thirds width of that article; second and third articles each with a sensory filament at apex. No suburopodal shelf

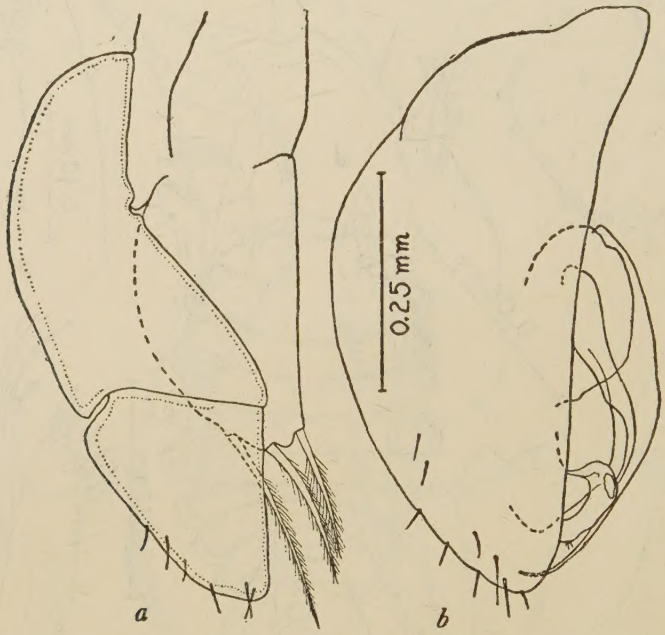

FIGURE 50.—*Munna stephenseni* Gurjanova: *a*, Third pleopod, male; *b*, second pleopod, male. (Magnification as indicated by scale.)

evident. Ventral uropodal branch with a strong posteromedially directed spinelike tooth at posteromedial angle, in addition to several smaller teeth.

Supplementary descriptive notes:

Pleon.—Small specimens with two spinelike 2-pointed setae on each side, large specimens with one more such seta on each side.

First antenna.—Gurjanova describes two flagellar segments,[2] the second of which is long, and figures (enlarged drawing) a flagellum composed of three segments (plus a very minute terminal article), the long last article of her description being figured as two subequal joints. In one of the specimens that I examined the flagellum of the left antenna was composed of two articles, much as Gurjanova describes (plus the minute terminal article, which Gurjanova did not consider a separate article), while the right antennal flagellum re-

[2] Antenna 1 has a 2-jointed flagellum, with a large long last joint" (Gurjanova, 1933, p. 91).

sembled that figured (enlarged drawing) by Gurjanova. All the other specimens that were examined had a flagellum similar to that shown in figure 51, *a*, that is, one consisting of three articles, including the minute terminal article.

FIGURE 51.—*Munna stephenseni* Gurjanova: *a*, First antenna; *b*, carpus of seventh peraeopod; *c*, maxilliped; *d*, female gnathopod; *e*, male first pleopods; *f*, left mandible; *g*, distal articles of seventh peraeopod; *h*, left mandible. (Magnification as indicated by scales: *a*, *d*, *g*, and *h* same as *b*; *c* and *f* same as *e*.)

Second antenna.—Basal flagellar segments pink in life.

Maxilliped.—With three coupling hooks.

First maxilla.—Outer lobe with 12 setae, inner lobe with 4 apical setae.

Second maxilla.—Each of the two outer lobe lappets with 4 apical setae, inner lobe with about 13 large setae.

Mandible.—Left mandible incisor with five teeth, lacinia with four teeth, setal row with four setae. Right mandible lacking lacinia, incisor with four teeth, setal row with four setae. Terminal article of palp with three denticulate setae at apex. Molar process expanded at apex.

Adult male gnathopod.—With two blunt teeth on cutting edge of propodus and two longer teeth on cutting edge of carpus.

Subadult male gnathopod.—Resembles female gnathopod. A pair of pectinate scales present near inner margin of dactyl, propodus, and carpus. Number of 2-pointed setae appears variable, depending on size of specimen.

Types.—Type locality, Komandorskie Islands, seashore, Bering Sea. The types are located in the collections of the Zoological Museum of the Academy of Sciences, U. S. S. R.

Geographical distribution.—Bering Sea to Carmel Cove, Monterey, Calif.

Material examined.—Eleven male and 22 female specimens were examined that had been collected from various localities in Marin and Monterey Counties, Calif.

Remarks.—In juvenile specimens the very minute terminal article of the flagellum of the first antenna of the adult appears much longer and wider and is obviously a separate article (compare figs. 54, *a*, and 54, *b*). The aborted appearance of that article correlates with the development of a sensory filament at the apex of the penultimate flagellar article. This filament is lacking in very small specimens. As was earlier mentioned Gurjanova did not consider the minute article as a separate article in her description of *M. stephenseni.*

MUNNA CHROMATOCEPHALA, new species

FIGURES 52, 53

Holotype.—Adult male, length 2.2 mm., width 0.4 mm.

Allotype.—Ovigerous female, length 1.5 mm., width 0.7 mm.

Diagnosis.—Eyes bulging only very slightly, preorbital area almost contiguous with the lateral extent of eyes. Pleotelson smooth, lacking 2-pointed setae on lateral borders. Body covered with setae, especially on the dorsal surface of the pleotelson. Flagellum of first antenna composed of three articles, penultimate article scarcely exceeding twice the length of first article; last two flagellar articles

each with a single sensory filament at apex. Dentate suburopodal shelf lacking. Ventral uropodal branch with conspicuous spinelike projections or teeth.

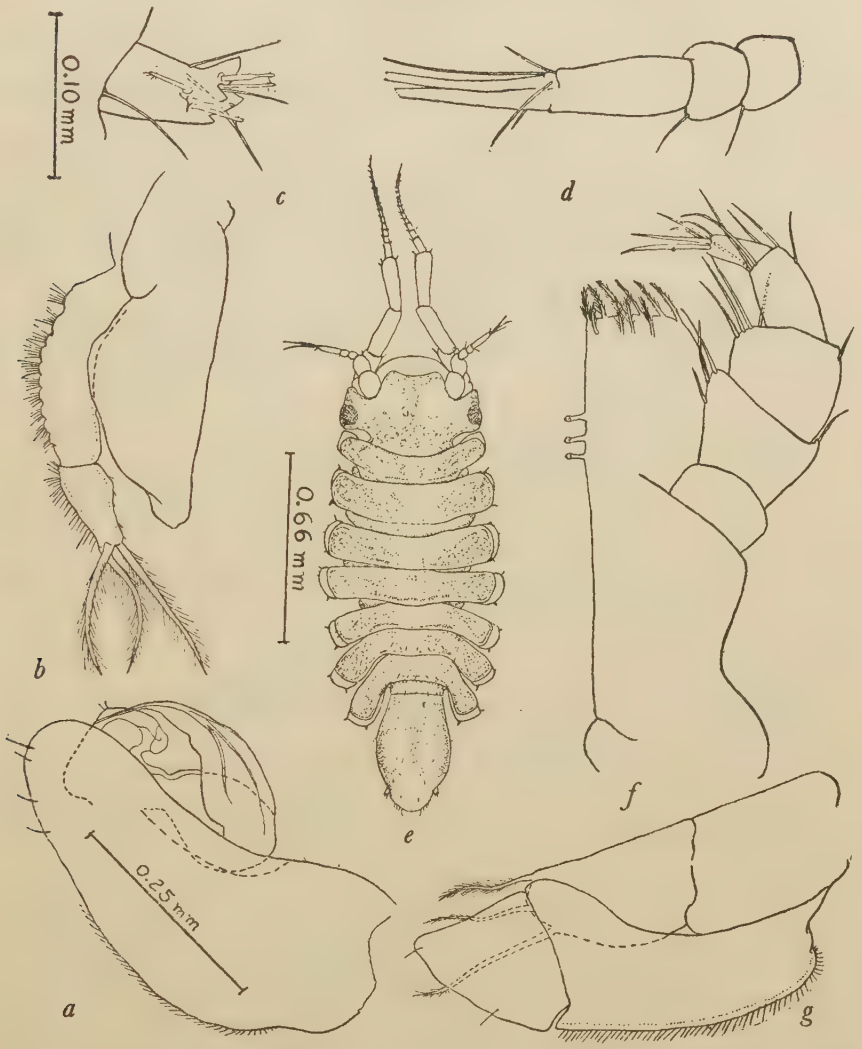

FIGURE 52.—*Munna chromatocephala*, new species: *a*, Second male pleopod; *b*, fourth male pleopod; *c*, right uropod; *d*, first antenna; *e*, male; *f*, maxilliped; *g*, third male pleopod. (Magnification as indicated by scales: *b* and *g* same as *a*; *d* and *f* unknown.)

Character of body.—Dark brown pigment patches on head and body distinctive.

Cephalon.—Frontal margin smooth, slightly concave in dorsal view.

Peraeon.—Epimeral plates evident in dorsal view on somites 2 to 7.

Pleon.—Posterior margin of pleotelson with four to five narrow setae on each side at apex.

Second antenna.—Shorter than body. Peduncle with squama clearly visible. Flagellum shorter than peduncle, composed of about 14 articles.

Maxilliped.—With three coupling hooks.

First maxilla.—Outer lobe with 12 apical setae, inner lobe with 4 apical setae.

Second maxilla.—Each of the 2 inner lobe lappets with 4 apical setae, outer lobe with 10 setae.

Mandible.—Left mandible incisor with five teeth, lacinia with four teeth, setal row with four setae. Right mandible lacking lacinia, incisor with four teeth, setal row with five setae, the first two of which are apically expanded with numerous teeth on cutting edge. Molar process apically expanded.

Adult male gnathopod.—Propodal inferior margin smooth, beset with six small setae; carpal cutting edge with two teeth and a few setae.

Subadult male gnathopod.—Similar to female, having two pectinate scales near inferior margins of carpus and propodus.

Seventh peraeopod.—Nine 2-pointed setae on inferior margin and three similar setae on superior margin of propodus of small specimen. Other peraeopods similar in general to seventh.

Uropod.—Posteromedial apex of ventral uropodal branch with a distinct spinelike projection.

First male pleopods.—Tips laterally expanded. Posterior margins of each with six marginal setae in mature specimens.

Female operculum.—Apex setiferous, evenly rounded, and with a slight median emargination.

Types.—Holotype, allotype, and 35 paratypes (13 females, 4 males, and 18 juveniles) collected at the type locality, Dillon Beach, First Sled Road, Marin County, Calif., in *Mytilus* biotope, January 23, 1948, by R. J. Menzies. Type specimens have been deposited in the collections of the following institutions:

United States National Museum, holotype (No. 89530), allotype, and 6 paratypes; Allan Hancock Foundation, 4 female paratypes; Rijksmuseum Van Natuurlijke Historie, Leiden, Holland, 1 paratype; Pacific Marine Station, 25 paratypes, accession numbers 1299–1302 Arth.

Geographical distribution.—Marin County, Calif.

Material examined.—In addition to the type specimens the following from California localities were examined:

Marin County: *Dillon Beach*, from holdfast of alga *Postelsia palmaeformis* washed onto beach, October 10, 1947, R. J. Menzies collector, two juvenile specimens; type locality, August 18, 1947, R. J. Menzies collector, 1 juvenile; *Tomales Point*, Tomales Bluff, May 23, 1948, 1 ovigerous female.

Ecology.—This species appears to be a prominent member of the *Mytilus-Mitella* biotope of exposed rocky coast localities. Ovigerous specimens were found during May.

FIGURE 53.—*Munna chromatocephala*, new species: *a*, First male pleopods; *b*, mature male gnathopod; *c*, distal articles of seventh peraeopod; *d*, subadult male gnathopod; *e*, left mandible; *f*, female operculum; *g*, distal portion of left mandible; *h*, distal joints of mandibular palp. (Magnification as indicated by scales: *f* same as *b*; *g* and *h* same as *d*; *c* unknown.)

Remarks.—This species, although bearing a slight resemblance to *Munna subneglecta* Gurjanova (1936, pp. 254–255, abb. 3), can be distinguished from that species readily by the fact that the tips of the male first pleopods are considerably expanded laterally. In *subneglecta* such tips are scarcely expanded laterally. The eyes of *subneglecta* are on short but obvious stalks, which structures are almost lacking in *chromatocephala*.

MUNNA HALEI, new species

FIGURES 54, 55

Holotype.—Subadult male, length 1.3 mm., width 0.5 mm.

Allotype.—Ovaries swollen, length 1.5 mm., width 0.6 mm.

Diagnosis.—Eyes bulging slightly, preorbital lobes evident. Pleotelson with lateral borders smooth, lacking 2-pointed setae. Dentate suburopodal shelf visible in dorsal view. Flagellum of first antenna composed of three joints, penultimate joint twice the length of the first joint; last two articles each with a single sensory filament at apex. Each male first pleopod laterally drawn out into a long, nar-

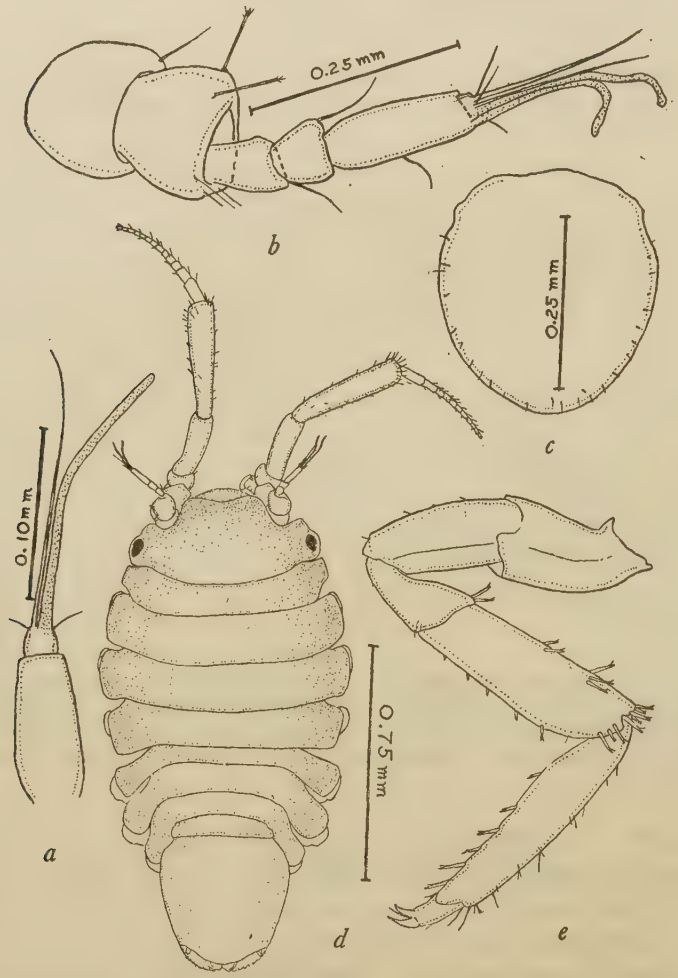

FIGURE 54.—*Munna halei*, new species: *a*, Distal articles, flagellum of first antenna, young specimen; *b*, first antenna, adult; *c*, female operculum; *d*, allotype; *e*, sixth peraeopod. (Magnification as indicated by scales: *e* same as *c*.)

row, pointed stylus. Uropod ventral branch lacking spinelike protuberances.

Character of body.—Body with few setae and a few dark pigments.

Second antenna.—Penduncle with squama. Flagellum as long as sixth article of penduncle. Antenna shorter than body length.

Maxilliped.—Endognath with apparently only two coupling hooks.

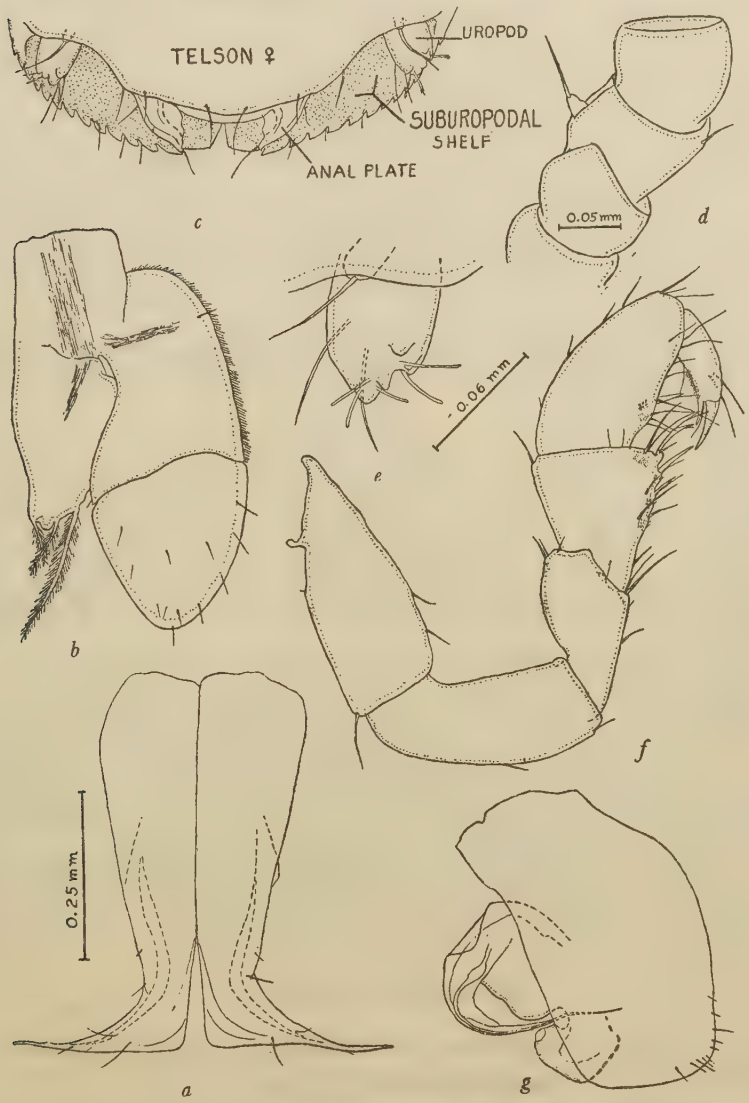

FIGURE 55.—*Munna halei*, new species: *a*, First male pleopods; *b*, third male pleopod; *c*, telson, posterior border; *d*, second antennal peduncle to show scale; *e*, right uropod; *f*, gnathopod, subadult male; *g*, male second pleopod. (Magnification as indicated by scales: *b*, *c*, *f*, and *g* same as *a*.)

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First maxilla.—Outer lobe with 10 apical setae, inner lobe with 4 apical setae.

Second maxilla.—Each of the two outer lobe lappets with 4 apical setae. Inner lobe with 10 apical setae and 3 marginal setae.

Mandibles.—Left mandible incisor with five teeth, lacinia with four teeth, setal row with four setae. Right mandible lacking lacinia, incisor with four teeth, setal row with five setae. Palp similar to that figured for *Munna stephenseni* (fig. 51, *f*).

Gnathopod.—Adult male gnathopods not observed. Subadult male and female gnathopods similar. Propodal inferior margin with one 2-pointed seta, carpal inferior margin with four 2-pointed setae.

Sixth peraeopod.—Propodus with six 2-pointed setae on inferior margin, none on superior margin. Other peraeopods similar to sixth.

Uropods.—Ventral branch cylindroid with six blunt projections at apex. Below uropods a suburopodal shelf, having a serrate outer margin, extends posteriorly beyond uropods and is thus visible in dorsal view.

First male pleopods.—Tips laterally expanded into narrow, elongate, styliform projections. Posterior margin of each pleopod with three marginal setae.

Female operculum.—Apex setiferous, evenly rounded.

Types.—Holotype (U.S.N.M. No. 89545), allotype, and one female paratype were collected at Tomales Bluff, Tomales Point, Marin County, Calif., bay side, May 23, 1948, by R. J. Menzies. The types, all in the collections of the United States National Museum, were collected in lowest intertidal zones under stones and in *Macrocystis* holdfast.

Geographical distribution.—Known only from the type locality.

Material examined.—Only the types have been examined.

Remarks.—This species, although resembling *Munna boeckii* in having a distinct dentate suburopodal shelf, differs from that species in lacking spines on the lateral borders of the pleotelson. The uropods and pleopods also differ in the two species.

This species is named in honor of Dr. Herbert M. Hale, director of the South Australian Museum, who has contributed so greatly to the knowledge of the marine Isopoda of Australia.

Family JANIRIDAE

(Cf. Nierstrasz and Schuurmans Stekhoven, Jr., 1930, p. X, e 116)

Genus IANIROPSIS G. O. Sars, 1897–99

Ianiropsis G. O. Sars, 1897–99, p. 102 (not *Janiropsis*, Sars' original spelling being *Ianiropsis*). (Genotype, *Ianiropsis breviremis* G. O. Sars, 1899.)

Diagnosis.—Cephalon, peraeon, and pleon lacking projecting lappets. Cephalon lacking a long rostrum. Epimeral plates visible in

dorsal view on at least peraeon somites 2 to 7. Pleon composed of two somites. Uropods of variable length. Maxillipedal palp consisting of five segments, second and third segments expanded, being much wider than endognath. Maxilliped with two coupling hooks. Male first pleopods laterally expanded at apex. Female operculum with distal margin blunt or slightly concave. Dactyl of first peraeopods biunguiculate; those of peraeopods 2–7 all triunguiculate. Propodus of male first peraeopod smooth, lacking a series of serrations on inferior margin but usually bearing a variable number of 2-pointed setae. Mandibular molar process expanded at tip, apex truncate; second article of palp bearing two long, fairly straight denticulate setae, between which is a smaller strongly curved denticulate seta. In adult males the first pair of peraeopods are often almost as long as the body when expanded. First antenna with a 4-jointed peduncle. Second antenna with a 6-jointed peduncle bearing an obvious squama on the lateral border of the third joint.

Remarks.—The diagnosis given by G. O. Sars (1897–99, p. 102) for this genus appears incorrect in one important respect: the dactyls of the 2 to 7 peraeopods are triunguiculate and not biunguiculate, as one would gather from that diagnosis.

The species belonging to this genus that I have seen differ from one another only in a few respects. Some have spinelike serrations on the lateral edges of the pleotelson, while in others those borders are smooth. In certain species the general shape and relative length of the uropods are distinctive. The most reliable diagnostic features seem to be present on the male first pleopod, particularly at the lateral apex. Thus, in some the apex is entire, while in others it bifurcates; in some it is directed laterally, and in others it is directed abruptly posteriorly. Only a combination of the several features mentioned above provides a satisfactory means of separating the species.

From the northern California coast the detection of seven species has been possible. Previously only one valid species was known from that area. The species described by Richardson as *Janiropsis californica* probably belongs to *Iais* and not to *Ianiropsis*. One of the species, *Ianiropsis analoga*, is so very closely related to the genotype that it may later be found identical with that species. However, since real differences are apparent it seems best to keep the forms separate, at least for the present.

Eupraxia Gurjanova's *Janiropsis derjugini* is believed to be only a subspecies of Richardson's *Janiropsis kincaidi* and is herein called *Ianiropsis kincaidi derjugini* Gurjanova. The species *I. pugettensis* Hatch (1947, p. 172) is a synonym of *I. k. kincaidi* Richardson, as indicated by a comparison of paratypes of that species with cotypes of Richardson's species.

KEY TO THE NORTHERN CALIFORNIA SPECIES OF IANIROPSIS

a^1. Lateral borders of pleotelson with spinelike serrations.
  b^1. Pleotelson with 4 to 7 spinelike serrations on each side. Lateral apex of each first male pleopod not directed abruptly posteriorly. I. analoga, new species
  b^2. Pleotelson with 2 spinelike serrations on each side. Lateral apex of each first male pleopod directed abruptly posteriorly. I. epilittoralis, new species
  b^3. Pleotelson with 3 spinelike serrations on each side. First male pleopods similar to but not identical with b^2 ---------- I. tridens, new species
a^2. Lateral borders of pleotelson lacking spinelike serrations.
  b^1. Uropods half or less than half length of pleotelson.
    c^1. Pleotelson with distinct posterolateral angles lateral to uropod insertions. Cephalon lacking anteriorly projecting anterolateral angles. I. kincaidi derjugini, new combination
    c^2. Pleotelson lacking posterolateral angles lateral to uropod insertions.
      d^1. Cephalon with a distinct spinelike anterolateral projection on each side of frontal margin ---------- I. magnocula, new species
      d^2. Cephalon with anterolateral margins evenly rounded. I. minuta, new species
  b^2. Uropods considerably exceeding half pleotelson length.
    c^1. Uropods exceeding pleotelson length. Apex of each first male pleopod bifurcating ---------- I. montereyensis, new species
    c^2. Uropods not exceeding pleotelson length. Apex of each male first pleopod not bifurcating --- I. kincaidi kincaidi Richardson, new combination

IANIROPSIS KINCAIDI KINCAIDI Richardson, new combination

FIGURES 56, *c*; 57, *a–e*

Janiropsis kincaidi RICHARDSON, 1904a, pp. 221–222, figs. 102–107; 1904b, pp. 665–666, figs. 7–12; 1905, pp. 456–457, figs. 509–514.
Ianiropsis pugettensis HATCH, 1947, p. 172, figs. 170–171.

Diagnosis.—Lateral borders of pleotelson smooth, lacking spinelike serrations, but bearing several setae; posterolateral angles acute but not projecting. Uropods not exceeding the pleotelson length. Each first male pleopod with lateral apex flattened, expanded, and directed laterally. First antennal articles considerably elongated compared with those of *I. kincaidi derjugini* (compare figs. 57, *e* and 57, *f*).

Types.—In the collection of the United States National Museum, No. 28717, from Yakutat, Alaska. Homoeotype male, length 3.8 mm., width 1.0 mm.

Geographical distribution.—Komandorskie Islands, Bering Sea, to Monterey County, Calif.

Material examined.—Specimens examined, 38 males and 50 females, were collected at various localities from the Komandorskie Islands, Bering Sea, to Monterey County, Calif.

Ecology.—See under *Remarks.* Ovigerous specimens were found during May and June.

Remarks.—In several significant respects the description given of this species by Harriet Richardson in her monograph (1905, pp, 456–457) is lacking or incorrect. The maxilliped has two coupling hooks; none were figured. The second and following peraeopods have triunguiculate dactyls, not biunguiculate as figured. The uropods do indeed slightly exceed half the abdomen length as is shown in the figures given by Miss Richardson and are "not longer than half the length of the terminal segment of the body" (Richardson, op. cit.).

This subspecies is identical in a number of important features with *I. kincaidi derjugini* Gurjanova. Of particular importance is the almost absolute similarity between the male first pleopods of the two subspecies. The subspecies differ from each other primarily only

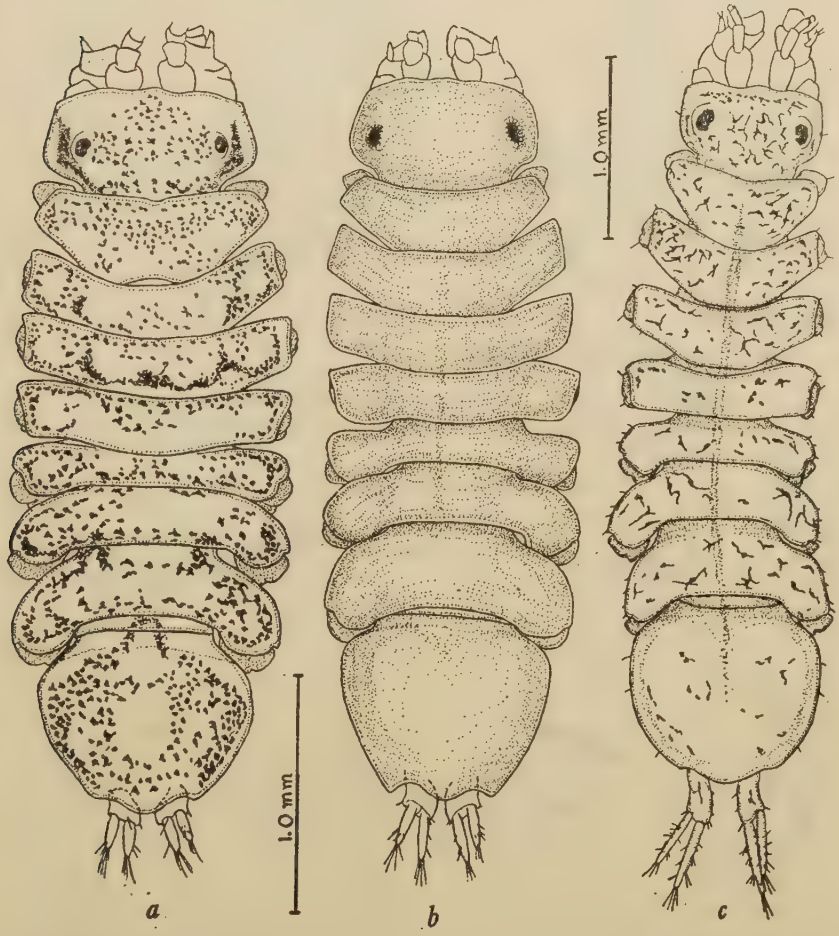

FIGURE 56.—*Ianiropsis kincaidi derjugini* Gurjanova: *a*, male; *b*, female. *I. k. kincaidi* Richardson: *c*, homoeotype male. (Magnification of *c* not known.)

in the morphology of the hinder margin of the pleotelson, in the relative length of the uropods compared with the pleotelson length, and

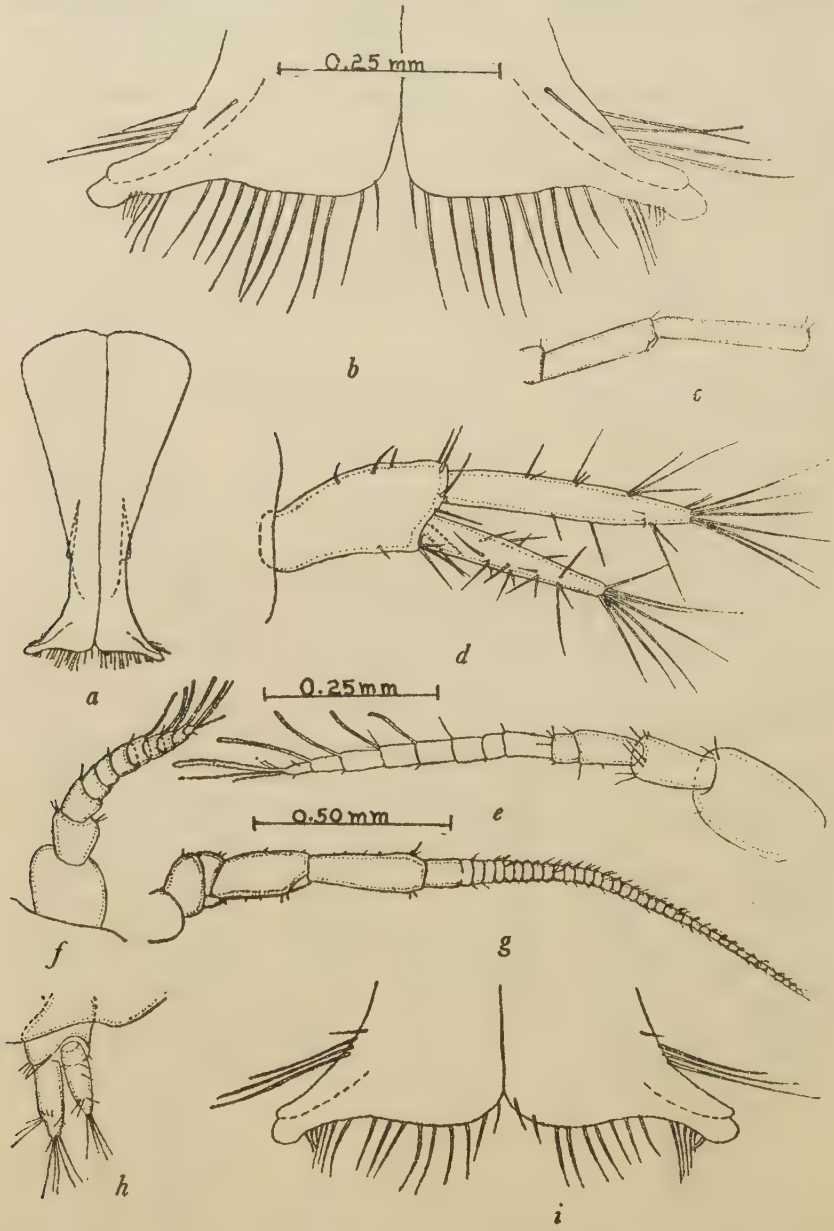

FIGURE 57.—*Ianiropsis kincaidi kincaidi* Richardson: *a*, Male pleopods; *b*, apex of male first pleopods; *c*, distal articles of peduncle of second antenna; *d*, uropod; *e*, first antenna. *I. k. derjugini* Gurjanova: *f*, first antenna; *g*, second antenna; *h*, uropod; *i*, apex of male first pleopods. (Magnifications as indicated by scales: *a* and *c* same as *g*; *i* same as *b*; *e*, *f*, and *h* same as *d*.)

in the relative lengths of the first and second antennal segments (compare diagnoses of the two subspecies).

Ecology.—Ecologically the two differ considerably. *I. k. kincaidi* is found in small pools on the surface of rocks where the water is supplied by wave splash and is subject to extremes in temperature. *I. k. derjugini*, on the other hand, is found under rocks in the middle and lower intertidal zones, often on and under rocks covered by the algae *Laminaria* and *Egregia*. Here of course the temperature is far less variable than that of the water of spray-filled tide pools.

A comparison of cotypes of *Janiropsis kincaidi* Richardson with paratypes of *Ianiropsis pugettensis* Hatch showed them to be identical.

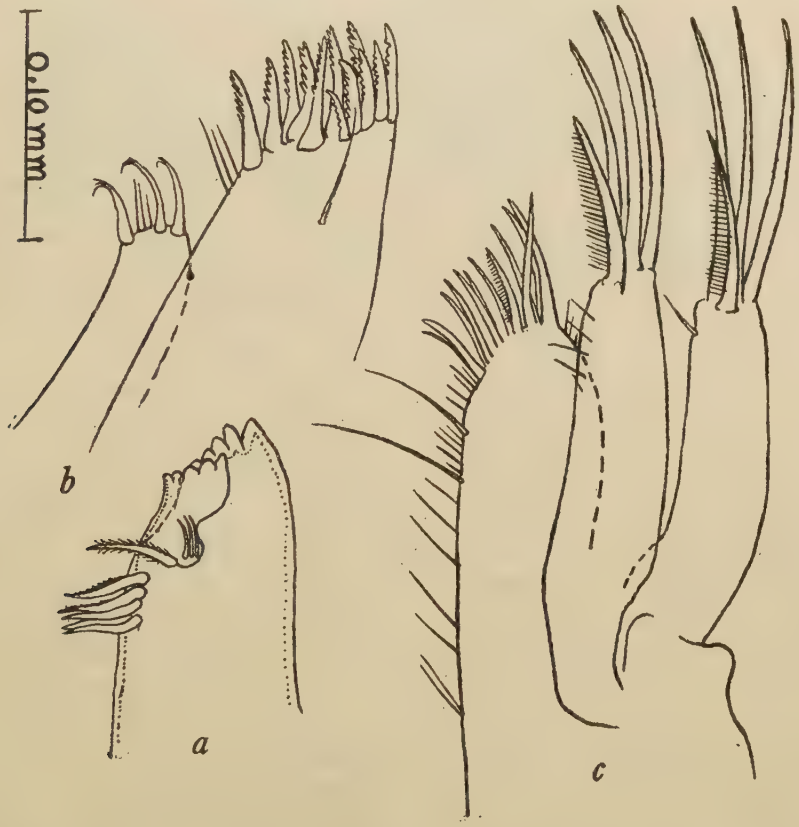

FIGURE 58.—*Ianiropsis kincaidi derjugini* Gurjanova: *a*, Incisor, lacinia, and setal row of left mandible; *b*, first maxilla; *c*, second maxilla. (Magnification as indicated by scale.)

IANIROPSIS KINCAIDI DERJUGINI Gurjanova, new combination

FIGURES 56, *a*, *b*; 57, *f-i*, 58; 59

Janiropsis derjugini GURJANOVA, 1933, pp. 82–83 (in Russian), p. 90 (in English), figs. 5, *a–e*, 6, *a–f*.

Diagnosis.—Lateral borders of pleotelson smooth, lacking setae and spinelike serrations; posterolateral angles acute and projecting. Uro-

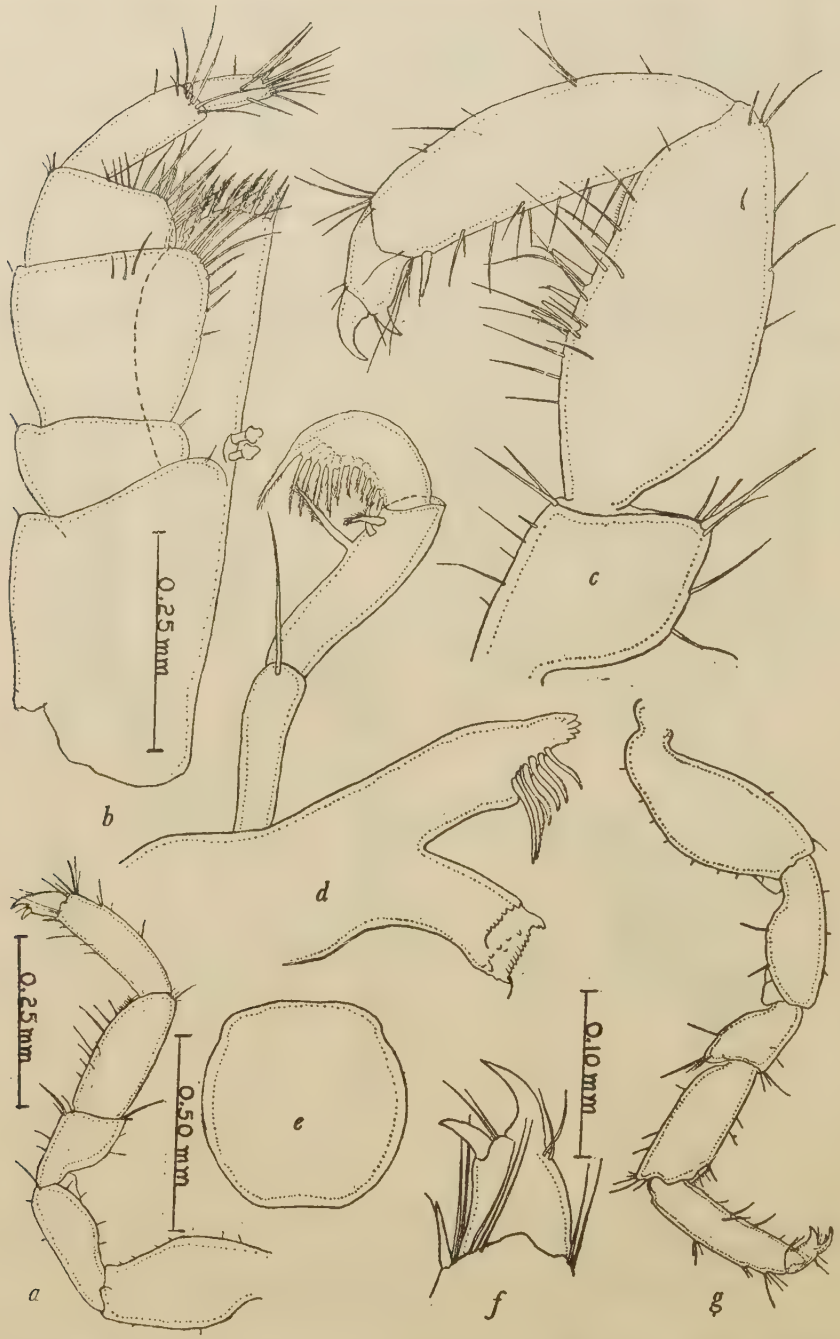

FIGURE 59.—*Ianiropsis kincaidi derjugini* Gurjanova: *a*, Female first peraeopod; *b*, maxilliped; *c*, male first peraeopod; *d*, right mandible; *e*, operculum, female; *f*, dactyl of first peraeopod; *g*, seventh peraeopod. (Magnification as indicated by scales: *g* same as *a*; *c* and *d* same as *b*.)

pods not exceeding half the pleotelson length. Male first pleopods as in *I. k. kincaidi.* First and second antennal articles considerably shortened compared with those of *I. k. kincaidi* (compare figures 57, *e*, and 57, *f*).

Types.—In the collections of the Zoological Museum of the Academy of Sciences, U. S. S. R., from Komandorskie Islands, Bering Sea. Male, length 2.5 mm., width 1.0 mm.

Geographical distribution.—Komandorskie Islands, Bering Sea, to Monterey County, Calif.

Material examined.—I have examined 47 male and 46 female specimens, from various localities in northern California.

Ecology.—See remarks for *I. k. kincaidi.* Ovigerous specimens were collected during February, May, and June.

Remarks.—Gurjanova makes no mention of the two coupling hooks present on each maxilliped. Her figures of the abdomen of the species do not compare favorably, the uropods shown in figure 5, *a*, being considerably longer than those shown in figure 5, *e*. Presumably both figures are of the same species. In most respects her description and figures indicate that the specimens I have seen are identical with her species. I consider this form a subspecies of *I. k. kincaidi* (see remarks concerning that subspecies).

IANIROPSIS ANALOGA, new species

FIGURES 60–62

Janira maculosa Leach, HATCH, 1947, p. 171, not figs. 37–38.

Holotype.—Male, length 3.7 mm., width 1.0 mm.

Allotype.—Length 2.5 mm., width 0.8 mm.

Diagnosis.—Cephalon with frontal margin slightly trilobed. Pleotelson with 4 (juvenile specimens) to 7 (adult specimens) spine-like serrations on either side above uropods. Uropods somewhat flattened, exceeding three-quarters the pleotelson length. Flagellum of first antenna composed of about 10 (average) subequal articles. Each male pleopod with expanded lateral apex pointed, posterior margin gently curving posteriorly.

Character of body.—Body speckled with numerous black chromatophores. Epimeral and pleotelsonal setae give borders of body a hirsute appearance. Eyes black in life.

Pleon.—Posterior margin lacking acute posterolateral angles.

First antenna.—Flagellum with 5 to 15 subequal articles.

Second antenna.—About as long as body. Flagellum with about 63 subequal segments.

Maxilliped.—Palp of male and female similar.

First maxilla.—Outer lobe with 12 setae, inner lobe with 4 apical setae.

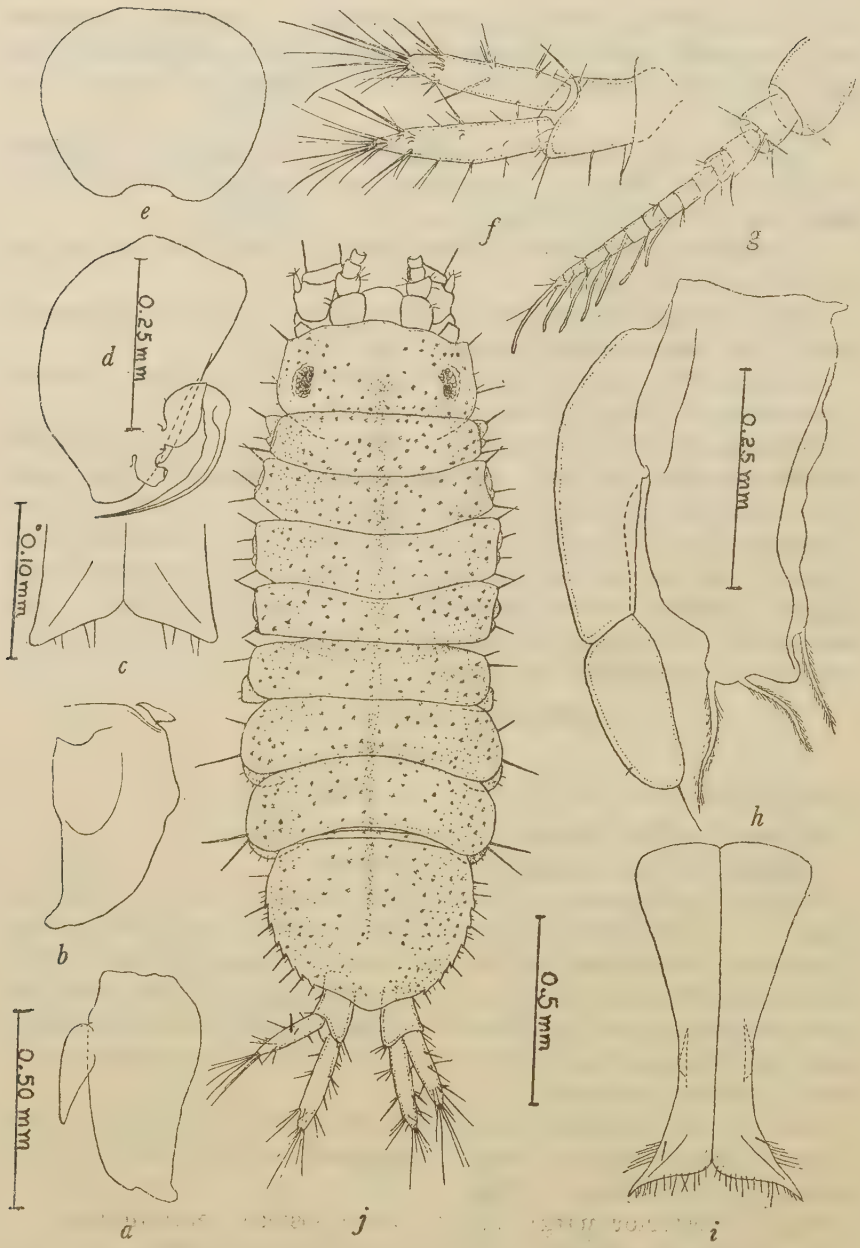

FIGURE 60.—*Ianiropsis analoga*, new species: *a*, Fourth male pleopod; *b*, fifth male pleopod; *c*, immature first male pleopods, apex; *d*, second male pleopod; *e*, female operculum; *f*, uropod; *g*, first antenna; *h*, third male pleopod; *i*, first male pleopods; *j*, paratype. (Magnifications as indicated by scales: *b*, *e*, and *i* same as *a*; *f* and *g* same as *d*.)

Second maxilla.—Each of the two outer lobe lappets with 4 apical setae, inner lobe with about 17 setae.

Mandible.—Left mandible incisor with five teeth, lacinia with five teeth, setal row with six setae in a row plus an isolated one between

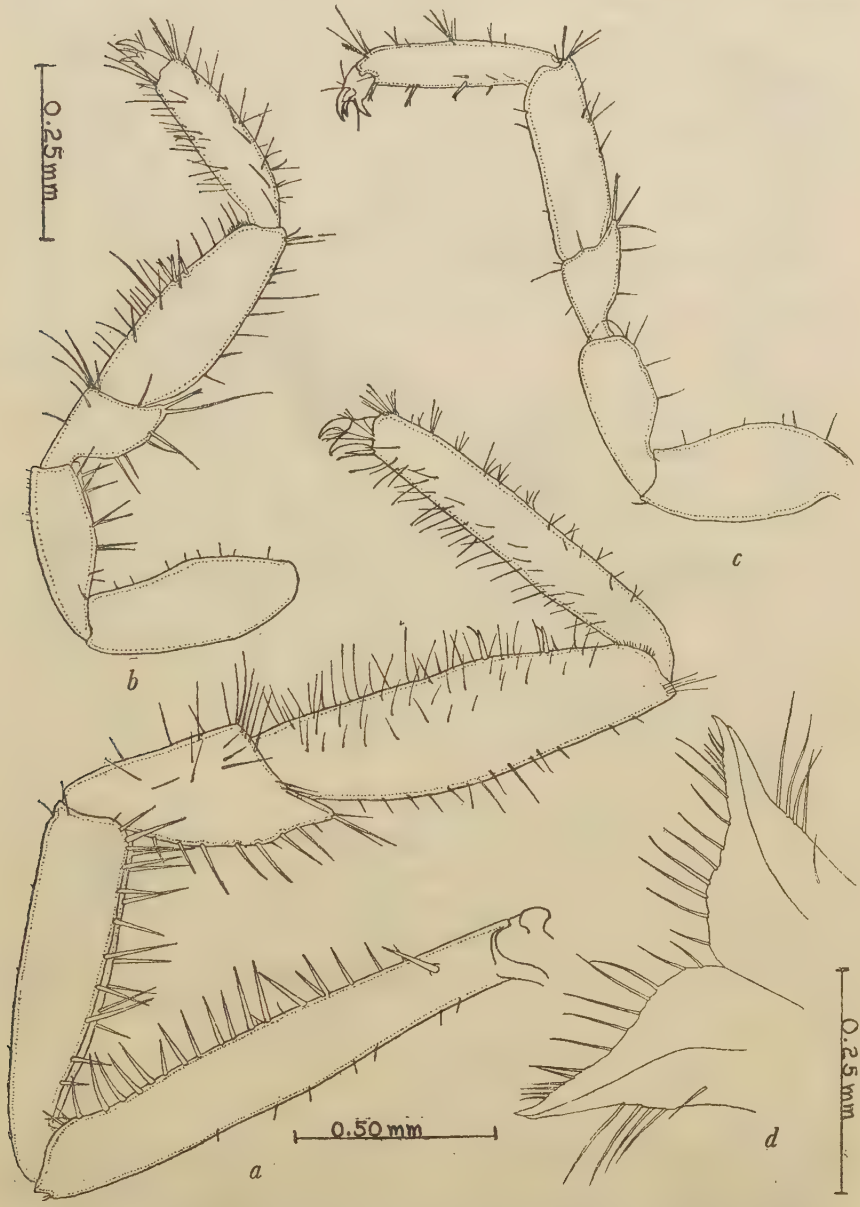

FIGURE 61.—*Ianiropsis analoga*, new species: *a*, First peraeopod of mature male; *b*, first peraeopod of female; *c*, seventh peraeopod of male; *d*, apex of first male pleopods. (Magnification as indicated by scales: *c* same as *b*.)

the row and lacinia. Right mandible incisor with five teeth, lacinia lacking, setal row with eight setae.

Mature male first peraeopod.—About as long as body when expanded.

FIGURE 62.—*Ianiropsis analoga*, new species: *a*, Maxilliped; *b*, left mandible; *c*, left mandible; *d*, right mandible; *e*, second maxilla; *f*, inner lobe of first maxilla; *g*, outer lobe of first maxilla; *h*, antennal scale. (Magnification as indicated by scales: *b* same as *a*; *c*, *e*, *f*, *g*, and *h* same as *d*.)

Uropods.—Inner branch as wide as and slightly longer than outer branch. Basal segment shorter than inner branch.

Types.—Holotype male collected at the type locality, Tomales Point, bay side near channel, Marin County, Calif., November 28, 1947, by R. J. Menzies; type found on *Macrocystis* holdfast. Type material has been deposited as follows:

United States National Museum, male holotype (No. 89535), allotype, and 15 paratypes. Allan Hancock Foundation, 6 paratypes. Universitets Zoologiske Museum, Oslo, Norway, 4 paratypes. Rijksmuseum Van Natuurlijke Historie, Leiden, Holland, 4 paratypes. Pacific Marine Station, 11 paratypes, accession numbers 1320–1322 Arth. University of Washington, 11 paratypes.

Geograpical distribution.—Turn Island, Wash., to Marin County, Calif.

Material examined.—In addition to the holotype the following specimens were examined:

WASHINGTON: *Turn Island*, Turn Rock, under rock at low tide, July 17, 1940, 11 paratypes, F. A. Pitelka collector. CALIFORNIA: *Marin County*, Tomales Point, bay side, *Egregia* and *Laminaria* holdfasts, November 30, 1947, three males and one female, paratypes, collected by R. J. Menzies. Dillon Beach, Second Sled Road, under rocks, February 21, 1948, 13 paratypes, collected by R. J. Menzies; from *Laminaria* holdfast, March 22, 1948, 6 paratypes, R. J. Menzies, collector; under rocks and on *Laminaria* holdfasts, May 12, 1948, 16 paratypes, collected by R. J. Menzies.

Ecology.—Most specimens were found under rocks in the lower intertidal zones and among holdfasts of the algae *Macrocystis*, *Laminaria*, and *Egregia*. Ovigerous specimens were observed during February and May.

Remarks.—The specimens reported by Dr. Melville Hatch from Washington as *Janira maculosa* have been examined and in my opinion they belong to this species. *Ianiropsis analoga* differs from *I. breviremis* (G. O. Sars) in the following features: 1, Posterior margin of male first pleopods distinctly curving posteriorly, lateral apices pointed, not minutely bifid; 2, cephalon frontal margin slightly trilobate, not transverse.

IANIROPSIS MAGNOCULA, new species

FIGURES 63–65

Holotype.—Female with partly developed oostegites, length 2.2 mm., width 0.8 mm.

Diagnosis.—Cephalon with conspicuous frontally projecting anterolateral angles; frontal margin with a very short, yet evident, rostrum.

Eyes large, globose, situated less than half the width of eyes from shelflike lateral borders. Pleotelson subcircular in outline, with a very small posteromedial lobe and lateral borders that are smooth except for a very few setae. Uropods flattened, length slightly less than half the pleotelson length. First antenna flagellum with first article exceeding two times the length of second article.

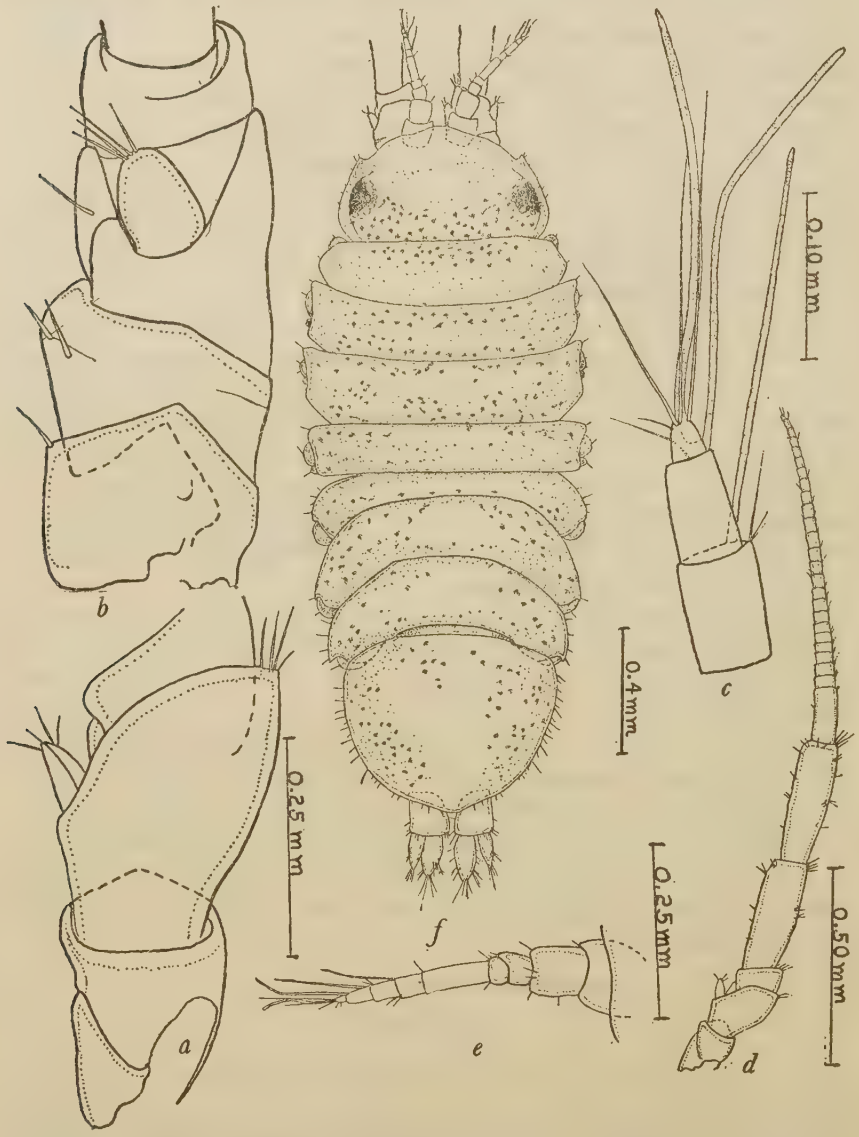

FIGURE 63.—*Ianiropsis magnocula*, new species: *a*, Proximal articles of second antenna peduncle; *b*, proximal articles of second antenna peduncle; *c*, distal joints of flagellum of first antenna; *d*, second antenna; *e*, first antenna; *f*, holotype. (Magnification as indicated by scales: *b* same as *a*.)

Character of body.—Entire animal appears very flattened. Color white with numerous scattered black chromatophores.

Second antenna.—About as long as body, reaching near middle of pleotelson when retracted. Flagellum composed of about 23 subequal articles.

First maxilla.—Outer lobe with 11 setae, inner lobe with 5 setae.

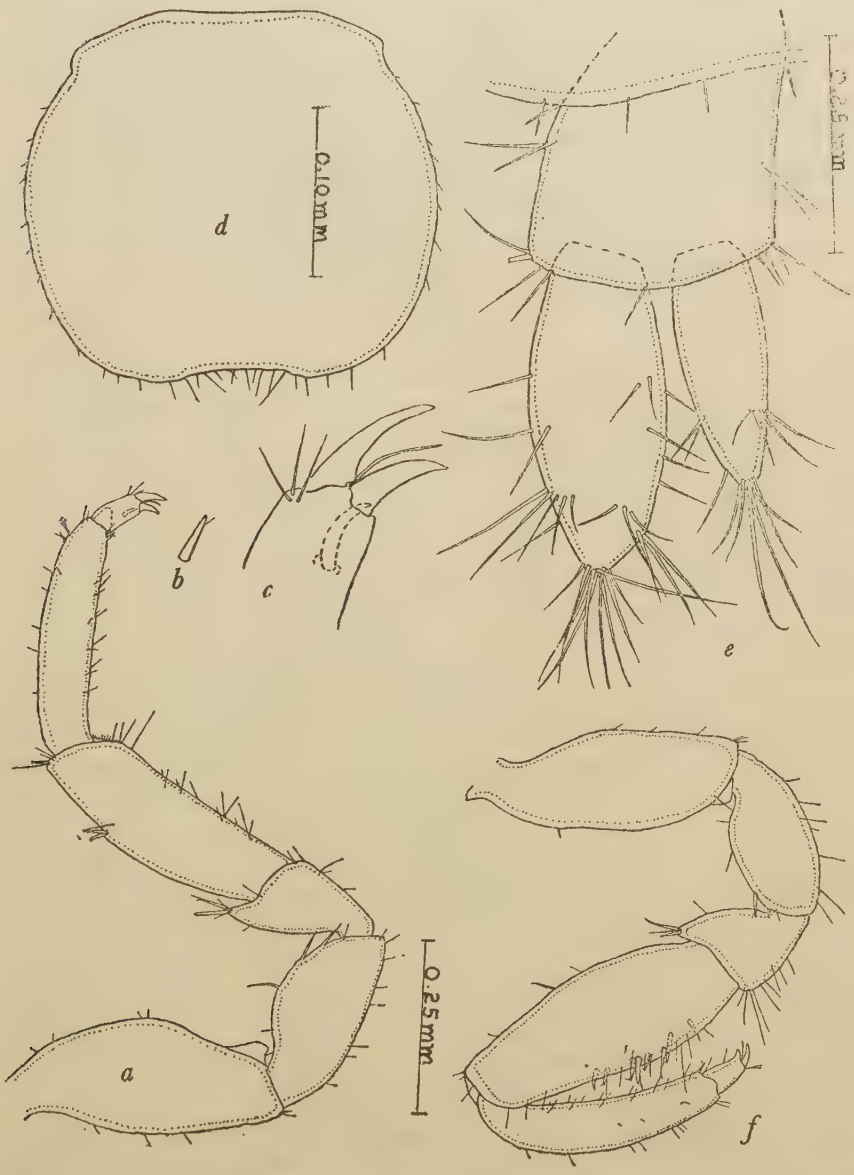

FIGURE 64.—*Ianiropsis magnocula*, new species: *a*, Seventh peraeopod; *b*, 2-pointed seta on seventh peraeopod; *c*, dactyl of seventh peraeopod; *d*, female operculum; *e*, uropod; *f*, first peraeopod. (Magnification as indicated by scales: *f* same as *a*; *b* and *c* same as *d*.)

Second maxillae.—Each of the two outer lobe lappets with four apical setae, inner lobe with about eight setae.

Mandible.—Left mandible incisor with five teeth, lacinia with four teeth, setal row with four plus one setae. Right mandible incisor with five teeth, lacinia lacking, setae not counted (mandible not dissected out).

FIGURE 65.—*Ianiropsis magnocula*, new species: *a*, First maxilla; *b*, third (?) pleopod; *c*, maxilliped; *d*, second maxilla; *e*, left mandible. (Magnification as indicated by scales: *a* and *e* same as *c*.)

Female operculum.—Wider than long, beset with marginal setae and bearing a distinct wide median emargination on posterior border.

Type.—The holotype, the only specimen known, is in the collection of the United States National Museum (No. 89538). It was collected in the Pacific Ocean, 3 miles off the mouth of Russian River, Calif., 31 fathoms depth, from fine green mud, July 13, 1947, Paul Quyle and Richard J. Waidzunas collectors; found with the sea star *Luidia foliolata* Grube and the isopod *Pleurogonium californiense* Menzies, taken from mud brought to the surface in a fisherman's net.

Geographical distribution.—Known only from the type locality.

Remarks.—This specimen to a considerable extent resembles *Janira japonica* Richardson (1909, pp. 114–115). It appears to differ from that species in having much shorter uropods and in having the dactyls of peraeopods 2–7 triunguiculate, not biunguiculate.

IANIROPSIS EPILITTORALIS, new species

FIGURES 66, 67

Holotype.—Male, length 3.8 mm., width 1.1 mm.

Allotype.—Ovigerous, length 2.5 mm., width 0.6 mm.

Diagnosis.—Frontal margin of cephalon very slightly concave, but having a short medial rostrum. Lateral borders of pleotelson each with two very inconspicuous spinelike serrations; a long seta located at posterior base of each serration. Uropods exceed three-fourths length of pleotelson. First antennal flagellum composed of nine (average) articles. Lateral apex of each first male pleopod pointed and directed abruptly posteriorly.

Character of body.—Usual color green with numerous scattered black chromatophores. Eyes black in life.

Pleotelson.—Posterior margin with only a slight indication of a wide median lobe; acute posterolateral angles lacking.

Second antenna.—Flagellum with about 66 segments in adult specimens. Antenna longer than body.

Maxilliped.—Palp of male and female similar.

First maxilla.—Outer lobe with 12 setae, inner lobe with 4 setae.

Second maxilla.—Each of the 2 outer lobe lappets with 4 setae, inner lobe with about 12 setae.

Mandible.—Left mandible incisor with five teeth, lacinia with five teeth, setal row with four plus one setae. Right mandible incisor with five teeth, lacinia lacking, setal row with eight setae.

Types.—The holotype, allotype, and eight paratypes were collected at the type locality, Dillon Beach, First Sled Road, Marin County, Calif., May 2, 1948, by R. J. Menzies; types found in tide pool on top of *Mytilus*-covered rock. Additional type material has been deposited in the following institutions:

United States National Museum, holotype (No. 89539); allotype, and 10 paratypes. Allan Hancock Foundation, 4 paratypes. Universitets Zoologiske Museum, Oslo, Norway, 4 paratypes. Rijksmuseum Van Natuurlijke Historie, Leiden, Holland, 4 paratypes. Pacific Marine Station, 12 paratypes, accession numbers 1323–1324 Arth.

Geographical distribution.—Marin County to Monterey County, Calif.

Material examined.—In addition to the above-mentioned specimens the following were examined from California localities:

MARIN COUNTY: Type locality, May 16, 1948, R. J. Menzies, collector,

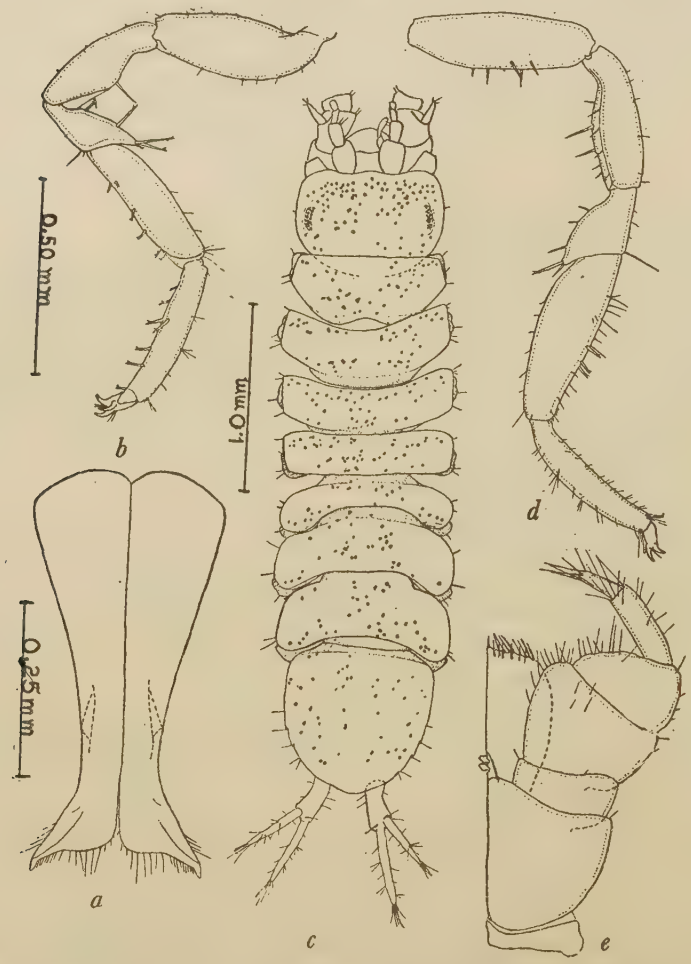

FIGURE 66.—*Ianiropsis epilittoralis*, new species: *a*, Male first pleopods; *b*, seventh peraeopod; *c*, male; *d*, male first peraeopod; *e*, maxilliped. (Magnifications as indicated by scales: *e* same as *a*; *d* same as *b*.)

24 paratypes. MONTEREY COUNTY: *Pacific Grove*, from elevated tide pools, date?, H. Heath collector, 5 paratypes.

Ecology.—Found in elevated, spray-filled tide pools, often with specimens of *Ianiropsis kincaidi kincaidi* Richardson. Ovigerous specimens were found in May.

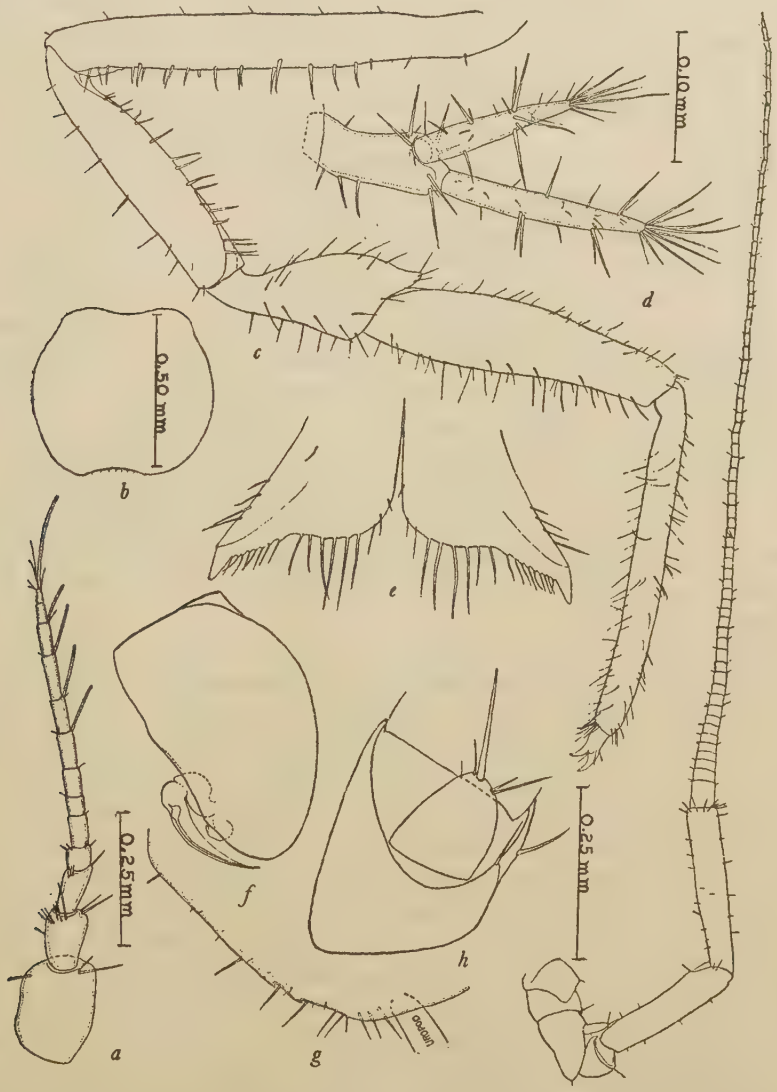

FIGURE 67.—*Ianiropsis epilittoralis*, new species: *a*, First antenna; *b*, female operculum; *c*, adult male first peraeopod; *d*, uropod; *e*, first male pleopods; *f*, second male pleopod; *g*, posterolateral margin of pleotelson; *h*, antennal scale; *i*, second antenna. (Magnifications as indicated by scales: *f* and *g* same as *a*; *c* and *i* same as *b*; *e* same as *h*.)

IANIROPSIS MONTEREYENSIS, new species

FIGURES 68, 69

Holotype.—Male, length 3.3 mm., width 1.0 mm.

Allotype.—Ovigerous, length 3.6 mm., width 1.2 mm.

Diagnosis.—Cephalon with a short conspicuous triangulate rostrum. Eyes red in life. Pleotelson ovate, lacking lateral spinelike serrations but bearing several long setae. Uropods elongate, as long as or slightly longer than pleotelson. First antennal flagellar articles subequal in length. Each male first pleopod bifurcating at lateral apex.

Character of body.—Covered with scattered black chromatophores.

Second antenna.—Flagellum with about 91 articles. Length slightly exceding body length.

First maxilla.—Outer lobe with 12 setae, inner lobe with 5 setae.

Second maxilla.—Each of the 2 outer lobe lappets with 4 apical setae, inner lobe with about 14 setae.

Mandible.—Left mandible incisor with five teeth, lacinia with five teeth, setal row with three plus one setae. Right mandible incisor with five teeth, lacinia lacking, setal row with six setae.

Uropods.—Very elongate, peduncle about as long as inner branch.

Types.—The holotype, allotype, and 18 paratypes were collected at the type locality, Pescadero Point, Monterey County, Calif., July 19, 1947, by John Davis; lowest intertidal zone under sponge-encrusted rock. Type specimens have been deposited in the following institutions:

United States National Museum, holotype (No. 89551); allotype and 35 paratypes. Allan Hancock Foundation, 2 paratypes. Universitets Zoologiske Museum, Oslo, Norway, 2 paratypes. Rijksmuseum Van Natuurlijke Historie, Leiden, Holland, 2 paratypes. Pacific Marine Station, 12 paratypes, accession numbers 1325–1326 Arth.

Geograpical distribution.—Marin to Monterey Counties, Calif.

Material examined.—In addition to the above-mentioned specimens the following were examined, all from California localities:

MARIN COUNTY: *Dillon Beach*, on beach in *Macrocystis* holdfast, October 10, 1947, R. J. Menzies collector, 1 paratype. MONTEREY COUNTY: *Carmel Cove*, under rocks, lower zones, July 6, 1947, John Davis collector, 5 paratypes; July 1947, T. E. Bowman collector, 5 paratypes; *Point Pinos*, zones 3–4, July 4 and 12, 1947, John Davis collector, 4 specimens, 3 of them paratypes; *Asilomar*, lower zones under rocks, July 16, 17, and 21, 1947, John Davis collector, 21 paratypes.

Ecology.—Most of the specimens were found under rocks in the lower intertidal zones of exposed rocky coast localities. Ovigerous specimens were found during July and October.

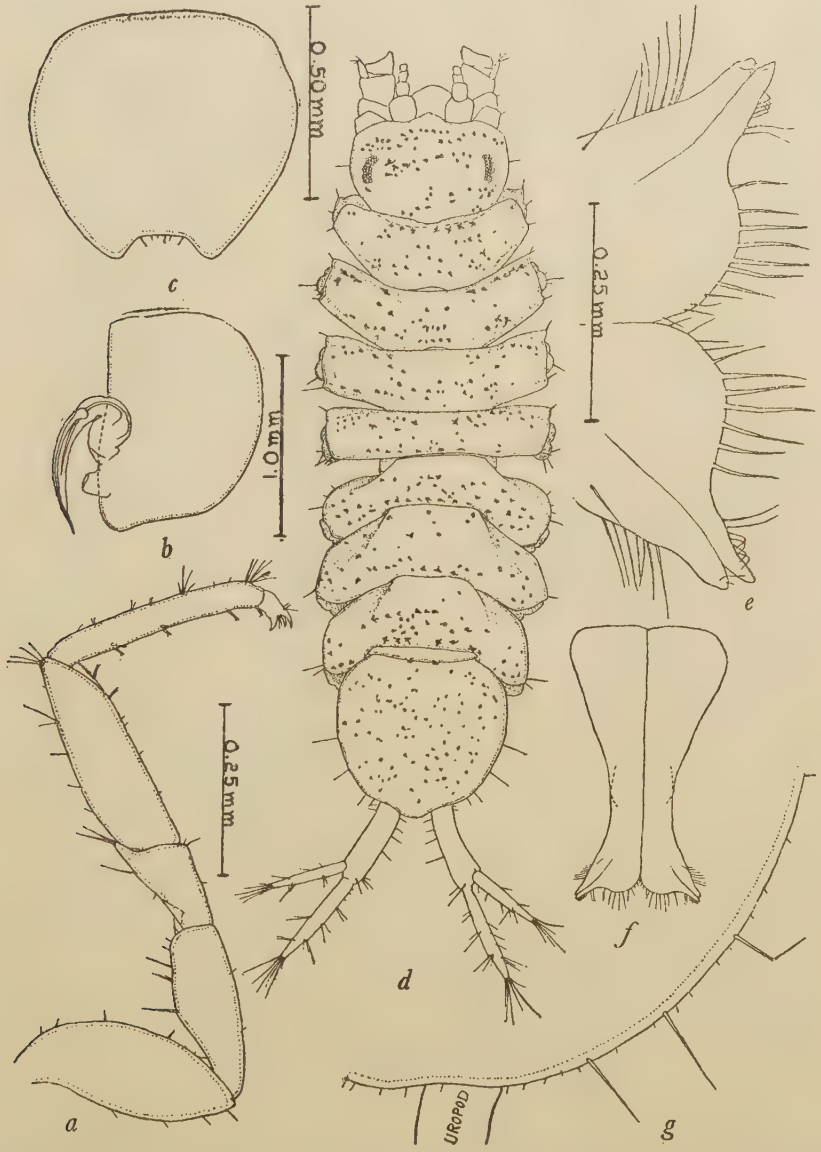

FIGURE 68.—*Ianiropsis montereyensis*, new species: *a*, Seventh peraeopod; *b*, second male pleopod; *c*, female operculum; *d*, male; *e*, male first pleopods; *f*, male first pleopods; *g*, posterolateral pleotelson margin. (Magnifications as indicated by scales: *g* same as *a*; *c* and *f* same as *b*.)

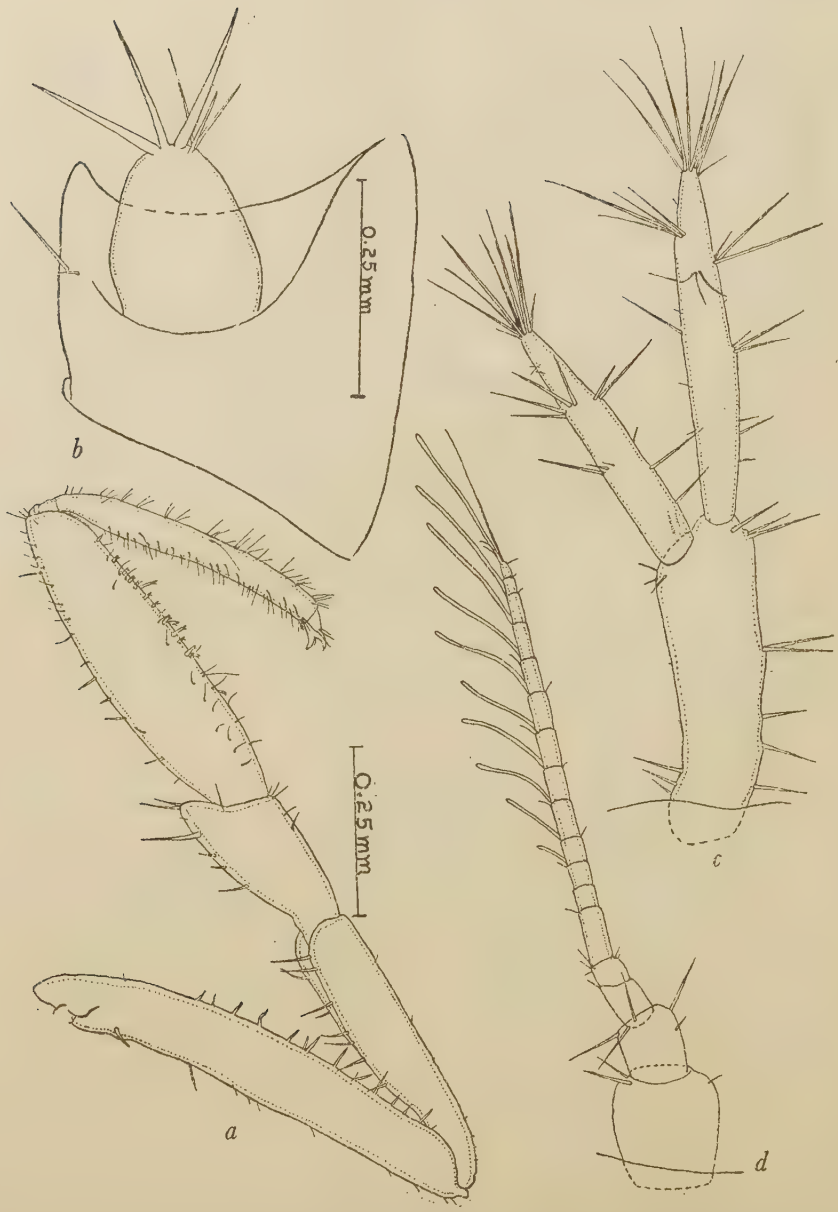

FIGURE 69.—*Ianiropsis montereyensis*, new species: *a*, Adult first peraeopod, male; *b*, antennal scale; *c*, uropod; *d*, first antenna. (Magnification of *a*, *c*, and *d* not known.)

IANIROPSIS MINUTA, new species

FIGURE 70

Holotype.—Male, length 1.3 mm., width 0.3 mm.

Allotype.—Ovigerous, length 1.3 mm., width 0.35 mm.

Diagnosis.—Frontal margin of cephalon almost transverse. Lateral pleotelson borders smooth, with a few small setae. Uropods about half the pleotelson length. First antennal flagellum with five articles (adult). Lateral apex of each first male pleopod irregular (fig.

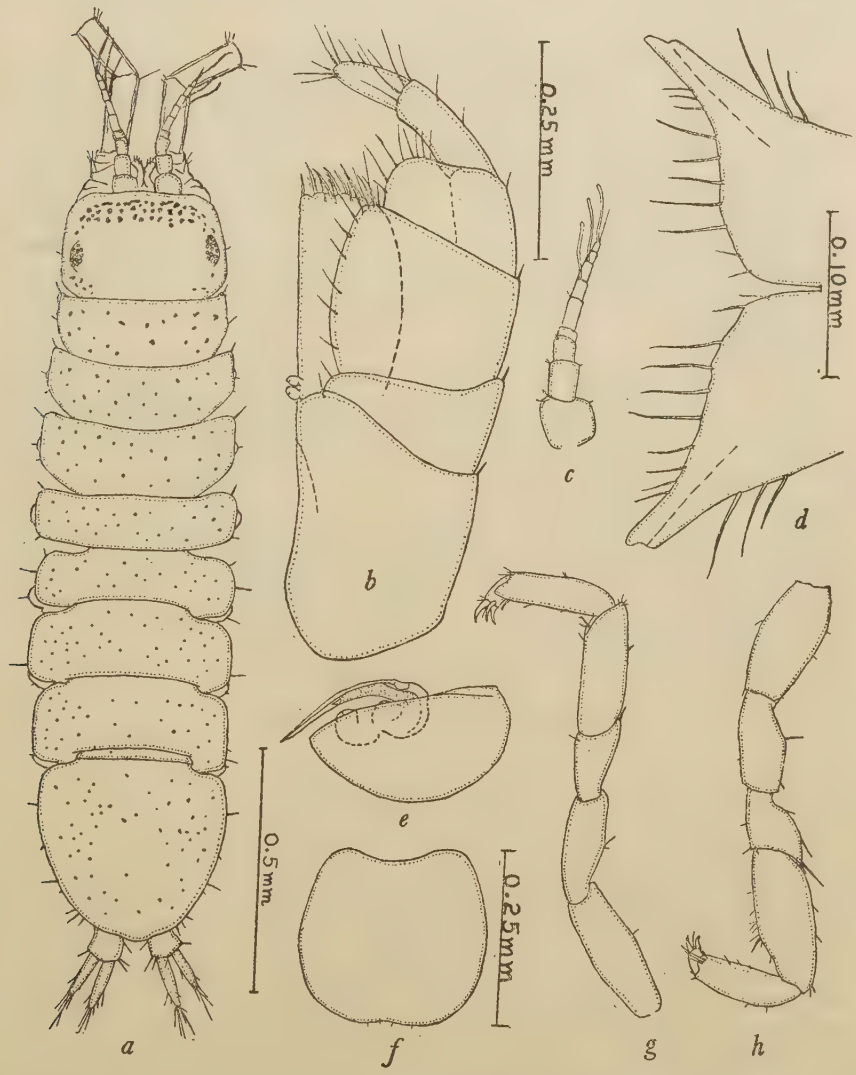

FIGURE 70.—*Ianiropsis minuta*, new species: *a*, Holotype; *b*, maxilliped; *c*, first antenna; *d*, male first pleopods; *e*, male second pleopod; *f*, female operculum; *g*, seventh peraeopod; *h*, first peraeopod. (Magnifications as indicated by scales: *c*, *e*, *g*, and *h* same as *f*.)

70, *c*), not directed abruptly posteriorly. A very small species, the adults being only slightly longer than postembryonic larvae of most species (e. g., specimens lacking developed seventh pair of peraeopods).

Character of body.—Small, with few scattered black chromatophores. Anterior part of cephalon with many black chromatophores.

Pleotelson.—Ovoid, with evident anterolateral angles, posterolateral angles lacking. Posterior border with short median convexity.

Second antennae.—Not so long as body. Flagellum with 27–32 subequal articles.

Maxilliped.—Those of male and female similar.

First maxilla.—Outer lobe with 13 setae, inner lobe with 3 setae.

Second maxilla.—Each of the two outer lobe lappets with four setae, inner lobe with about eight setae.

Mandible.—Left mandible incisor with five teeth, lacinia with five teeth, setal row with five setae. Right mandible incisor with five teeth, lacinia lacking, setal row with five setae. Second joint of palp with only two denticulate setae near distal end on inner margin.

Peraeopods.—Similar to those of *I. k. kincaidi* but sparsely setose in comparison.

Types.—The holotype (U.S.N.M. No. 89522), allotype, and 2 paratypes were collected at the type locality, Dillon Beach, Second Sled Road, Marin County, Calif., October 6, 1948, by R. J. Menzies; mid-intertidal, under rock. All are in the collection of the United States National Museum.

Geographical distribution.—Known only from Marin County, Calif.

Material examined.—Tomales Point reef, Marin County, Calif., 1 male paratype June 9, 1949, R. J. Menzies, collector, mid-intertidal zone among rock and sand.

Ecology.—Mid-intertidal, under rock and sand.

IANIROPSIS TRIDENS, new species

FIGURE 71

Holotype.—Male, length 2.5 mm., width 0.6 mm.

Allotype.—Not ovigerous, length 1.5 mm., width 0.5 mm.

Diagnosis.—Frontal margin of cephalon with a very slight median convexity. Each lateral (posterior half) border of pleotelson with three spinelike serrations. First antennal flagellum with nine articles (adult). Each lateral apex of first male pleopod directed posteriorly but apparently not as abruptly as in *I. epilittoralis* (compare figs. 67, *e* and 71, *e*). Uropods exceeding half the pleotelson length.

Character of body.—Chromatophores scattered irregularly over body. Eyes red in life.

Pleotelson.—Posterior border with an evident median lobe.

Maxilliped.—Those of male and female similar. Compares favorably with that figured for *I. minuta* and thus is not figured.

First maxilla.—Outer lobe with 13 setae, inner lobe 4 large setae plus several small setae.

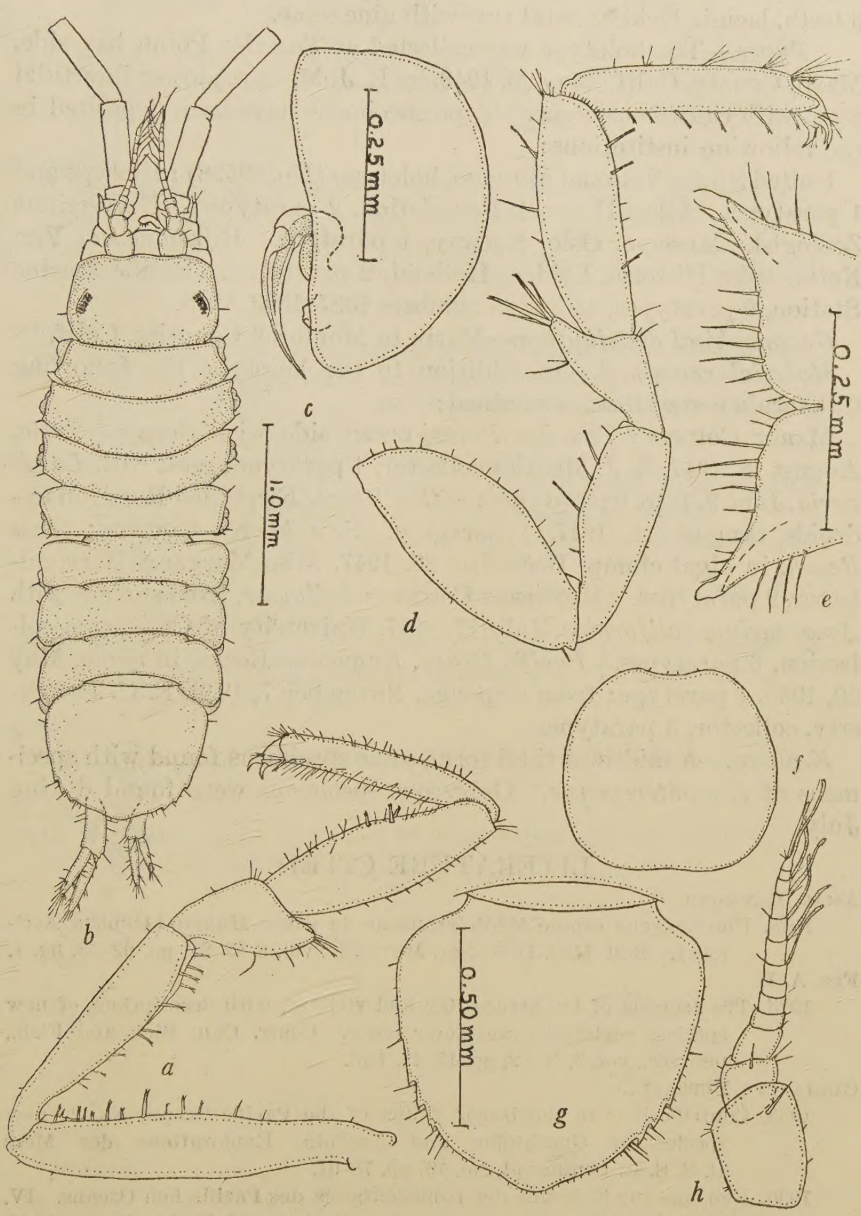

FIGURE 71.—*Ianiropsis tridens*, new species: *a*, First peraeopod of adult male; *b*, male; *c*, second male pleopod; *d*, seventh peraeopod; *e*, male first pleopods; *f*, female operculum; *g*, pleotelson; *h*, first antenna. (Magnifications as indicated by scales: *a* and *f* same as *g*; *d* and *h* same as *c*.

Second maxilla.—Each of the 2 outer lobe lappets with 4 setae, inner lobe with about 8 setae.

Mandible.—Left mandible incisor with five teeth, lacinia with five teeth, setal row with five plus one setae. Right mandible incisor with 5 teeth, lacinia lacking, setal row with nine setae.

Types.—The holotype was collected at Tomales Point, bay side, Marin County, Calif., May 23, 1948, by R. J. Menzies; lower intertidal zone, with calcareous algae. Type specimens have been deposited in the following institutions:

United States National Museum, holotype (No. 89528); allotype and 1 paratype. Allan Hancock Foundation, 2 paratypes. Universitets Zoologiske Museum, Oslo, Norway, 1 paratype. Rijksmuseum Van Natuurlijke Historie, Leiden, Holland, 2 paratypes. Pacific Marine Station, 9 paratypes, accession numbers 1327–1329 Arth.

Geographical distribution.—Marin to Monterey Counties, Calif.

Material examined.—In addition to the holotype the following California material was examined:

MARIN COUNTY: *Tomales Point*, ocean side with *Scrupocellaria*, August 18, 1947, R. J. Menzies collector, 1 paratype; reef, with *Laminaria*, June 9, 1948, 6 paratypes; *Dillon Beach*, First Sled Road, on hydroids, August 14, 1947, 1 paratype. SAN MATEO COUNTY: *Moss Beach*, in algal clump, December 26, 1947, Miss Margaret Barr collector, 2 paratypes. MONTEREY COUNTY: *Asilomar*, from surface with *Amaroucium californica*, July 17, 1947, University of California collection, 6 paratypes. *Pacific Grove*, Aumentos Rocks, in algae, May 20, 1930, 1 paratype; from a sponge, November 7, 1942, E. C. Dougherty, collector, 3 paratypes.

Ecology.—A mid-intertidal form, some specimens found with specimens of *I. montereyensis*. Ovigerous specimens were found during July.

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